THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

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"Office: No. 6, Charing-cross, London, April 6, 1854.
"Gentlemen,—I have much pleasure in informing you that the Jury has awarded to your firm 'HONOURABLE MENTION FOR LAP-WELDED IRON TUBES.' You are at full liberty, if you deem it likely to promote your mercantile advantage, to affix to these articles, during the season 1854, a card whereon this Award is printed, and also your prices, with name of agent, &c.—I am, gentlemen, your obedient servant,
"Messrs. JAMES RUSSELL and SONS, Wednesbury, STAFFORDSHIRE." "JOHN H. BOHN, Secretary.

JOURNAL OF GAS LIGHTING ONE NEWSPAPER

OXIDE OF IRON PURIFICATION.

AN Advertisement, announcing the production by Mr. Richard Laming of a very efficacious Oxide of Iron, as calculated to supersede that now so generally in use, having lately been inserted under the above heading in the JOURNAL OF GAS LIGHTING, the undersigned desire publicly to state the following facts:—

That by an indenture, dated March 30, 1855, made between Mr. Richard Laming of the one part, and the undersigned of the other part, which sets forth the dissolution of the then late firm of "Richard Laming and Co." (constituted of Mr. Richard Laming and the undersigned), and the terms upon which such dissolution had been arranged and agreed upon, mutual and reciprocal covenants were entered into by the parties with each other for the observance of such terms. And, by one of the articles or clauses in the same Indenture, Mr. Richard Laming is prohibited using Oxide of Iron for purifying Gas in any Gas-Works set forth or referred to in a certain Agreement made between the then late firm of Richard Laming and Co. and Mr. Frank Clark Hills, of Deptford, dated July 24, 1852; and by another of the articles or clauses in the same Indenture, the Purification of Gas by Oxide of Iron is, for certain valuable considerations, relinquished by Mr. Richard Laming to his then late partners, the undersigned.

That the Works set forth or referred to in the Agreement of July 24, 1852, comprise the Works of every Gas Company at that time established in England and Wales.

That the undersigned have given to Mr. Richard Laming notice in writing of their intention to proceed legally against him, if they shall at any time discover that, in contravention of the provisions of the Indenture of March 30, 1855, he shall have used, or caused or knowingly permitted to be used, any Oxide of Iron whatever for the purpose of purifying Gas.

Now, the undersigned hereby give Notice, that they will LIBERALLY REWARD any Person or Persons who will furnish them with legal proof of any such contravention by Mr. Richard Laming of the abovementioned provisions in the Indenture of March 30, 1855.

Witness our hands this 20th day of June, 1856,

OWEN & MERTENS.

Chemical Works, Mill Wall.

OXIDE OF IRON PURIFICATION.

MESSRS. OWEN and MERTENS, working under licence of Mr. F. C. HILLS, for the purifying of gas by revivified oxide of iron, are printing and circulating an advertisment publicly making known that they threaten me with LEGAL PROCEEDINGS if I do not succumb to the disputed construction they are putting on an indenture executed between them and myself. Now, the importance of the threat will be understood by reading one of the covenants of the indenture itself, and which thus alludes to all its articles:—"If any doubt hereafter exist as to their meaning, or any difficulty occur in carrying any of them out, or if any other difference or dispute arise between the parties hereto with respect to the subject of this agreement, then in either and every such case the parties hereto are severally pledged, ON THEIR HONOUR AS GENTLEMEN, AND ON THEIR INTEGRITY AS MERCHANTS, to submit to the decision which shall be jointly pronounced thereupon by [here are filled in two names, one of them being a solicitor in partnership with Mr. Mertens, the other also being highly respectable and ready to act], or, if need be, by their umpire or referees. RICHARD LAMING.

118, Fenchurch Street.

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MEAD'S PATENT DRY GAS REGULATOR is now used by a great number of gas companies and consumers. It is simple, easily fixed, and when adjusted requires no further attention.

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Beg to call the attention of English and Foreign Gas Companies, Gasfitters, and the Trade generally, to their extensive stock of the undermentioned articles, which are kept constantly in stock, viz.:—

EVERY VARIETY OF

GAS CHANDELIERS,

HALL LANTERNS, BRACKETS, PENDANTS, AND PILLARS OF THE NEWEST DESIGNS;

WROUGHT-IRON GAS TUBING,

And every description and size of IRON and BRASS FITTINGS, for GAS, STEAM, or WATER.

Architects and others are requested to inspect the beautiful Specimens of MEDIÆVAL CHURCH GAS-FITTINGS, designs of which will be forwarded to order.

STEAM, WATER, AND SANITARY APPARATUS, OF EVERY DESCRIPTION.

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MANUFACTORY, BILSTON STREET,
WOLVERHAMPTON.

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NOTICES.

The next number will be published on Tuesday, Aug. 19, and the subsequent numbers on each successive alternate Tuesday, till our project of weekly publication is carried into effect.

Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 5, 1856.

NOTES UPON PASSING EVENTS.

THE review of the parliamentary proceedings of this session is not much more creditable to the skill or discretion of the governmental authorities in matters connected with public health, than it has been in those of more decidedly political import. Anxious as we are that Government should enjoy the greatest amount of confidence and moral influence, we cannot but congratulate the public upon the frequent defeats to which the present Administration has been exposed in the measures it has presented for the purpose of changing the internal organisation of both private industrial operations, and of the municipal institutions their predecessors had established after long and careful investigation. Lord Palmerston and his colleagues seem to agree with Mawworm in some of his opinions, and to "like to be despised," as he did; otherwise it would be hard to explain why a statesman of his lordship's experience should allow his subordinates to introduce organic measures (to use a Gallicism), so carelessly and ignorantly prepared, that their rejection must be almost inevitable. All tastes are in nature; and so we will not stop to discuss this peculiar idiosyncracy of our facetious Premier; but it must be evident, that a Government which is thus frequently beaten upon matters of detail, must, sooner or later, suffer from the destruction of its influence upon public opinion; and that, although Lord Palmerston may command large majorities upon questions of foreign politics, upon which, as a nation, we are unfortunately both ignorant and indifferent, he will fall, unless he secures more judicious subordinates for the preparation and execution of the laws connected with home politics, which we can all see in action, feel, and appreciate. It is disgraceful for any Ministry to have introduced such measures as the Local Dues upon Shipping, the Partnership Amendment, the Public Health Act Amendment, the Medical Profession, and the Vaccination Bills, without taking precautions to ensure that they should at least be drawn up in such a manner as not to excite the inevitable opposition of all parties who have vested interests or strong covictions upon the subjects involved. Of all the coryphæi of the Ministry, Mr. Lowe seems to have exhibited "the greatest aptitude for sinking;" and certainly the manner in which he has comported himself during his career may be appealed to by those who question the use of high scholastic acquirements in the affairs of the world, as they are treated in our Legislature. Mr. Cowper, at the Board of Health, was not more fortunate than his colleague of the Board of Trade; but it is only fair to add, that his very kind and fascinating manners made even those who attacked the department over which he presided, regret the necessity for placing themselves in opposition to him. But, alike through Mr. Lowe's insolent manner, and his ignorance of the subjects he dealt with, and through Mr. Cowper's amiable deference to the bad counsels he received from the parties who have for so many years compromised the success of the sanitary improvement of the country, the Government has been invariably obliged to withdraw the measures brought forward under its auspices, and under the names of those gentlemen. The opposition has profited greatly by these repeated blunders, and Mr. Henley's judicious criticisms upon all practical matters have raised him in the opinion of men of business by all that the Government has lost in public estimation. It is curious, however, that our rulers should not perceive the folly of thus playing their adversaries' game.

Sir B. Hall has had quite enough upon his hands, it would appear—in defending the court project for spoiling the St. James's Gardens; in cleansing that Augean stable of corruption to which he succeeded after, we are now bound to suppose, those easy-going Kings Log, Sir William Molesworth and the present Duke of Somerset; in bullying the Metropolitan Board of Works; and endeavouring to ruin Mr. Page—to prevent his taking an active part in legislative affairs, otherwise than by voting in favour of the retiring pensions for his old enemies, the Bishops, and introducing two bills in the course of the session to explain and amend his *chef d'œuvre* of last year, "The Metropolis Bill of 1855," as Mr. Austin calls it. The conduct of the honourable baronet in the matter of the rejection of the outfall scheme seems to us to have furnished the truest illustration of his real character and tendencies, sad and equivocal as the measures adopted against Mr. Page unquestionably were. To us, at least, it seems evident that there was a predetermination on the part of Sir B. Hall to retard the operations of the Metropolitan Board, for he must have known at a very early period after the plans for the intercepting sewer were submitted to him, that the technical objection he ultimately raised then existed; and, therefore, the solemn farce of the float test was nothing more than a useless insult to the representative body with whose time he was thus uselessly dallying. The Metropolitan Board have, we think, acted wisely in publishing the whole of the correspondence on this matter (the letter of Mr. Austin, with its wilfully incorrect quotations from the act, and Captain Burstall's letter, and the diagram accompanying it); for the public is now enabled to judge of the scientific character of the opinions Sir B. Hall allows to guide his official proceedings; and we distinctly affirm that no town corporation would have accepted a report so manifestly unworthy of notice as that which Sir B. Hall has quoted in confirmation of his decision. In this ridiculous float test, it seems that the float used was "a pole weighted at one end, and submerged 14 feet." Now, we would ask what illustration would such a float offer of the movements of fluids, so dissimilar amongst themselves, as brackish and sewerage waters? The fœcal matters in the sewers are of course of less specific gravity than even ordinary land waters; sewerage waters, generally speaking, contain such gases as render them also specifically lighter than the Thames water at high tides at Plumstead usually is; so that both would float upon the surface rather than diffuse themselves through the thickness of 14 feet of the river water. It is true that they would in this case be likely to become affected by the surface velocity rather than by that of the mean velocity of the area observed, and that to a certain extent the float was a favourable experiment to the scheme of the board. But the question arises, how would the sewerage waters be discharged? would they not have an initial impulse towards the down stream, which would require to be overcome before they could be carried upwards? would they keep in the mid-channel, or, rather, would they not be displaced

by the denser brackish water—itself impressed with a powerful motion—and driven towards the shores, where their velocity would be checked by the friction upon the banks and the counter-currents which always prevail there? It is a disgrace, we repeat, to our scientific authorities, that grave questions, involving the investigations of the abstrusest laws of hydrodynamics should be treated in the manner that Captain Burstal has, no doubt, been compelled to treat this one. Why, the celebrated "turnip test" would have been of as much value as the use of a pole weighted at one end, and submerged 14 feet! We contend that neither of them are of any value in enabling us to arrive at correct conclusions with respect to the probable return of the sewerage from Plumstead to the heart of the metropolis. The result of this business, however, seems likely to be, that nothing whatever will be done in the sewerage interception; for the poor Metropolitan Board of Works appears now to be somewhat in the position of the animal whom old Charles Mathews described "as not being able to live on the land, but who died in the water." The outfall must not be at Plumstead—Erith won't have it; so the sewerage is to be sent to sea at an additional cost to the ratepayers of—it is impossible to say how many millions. In the meantime, the Registrar-General shows that there has been a marked improvement in the sanitary condition of the town; and the same imposing authority, after declaring—page 5 of his "Quarterly Return" No. 29—that "the principal cause of the insalubrity of the dense districts is the want of adequate means to redistribute over the earth the organic matter which is reduced to refuse in the towns," now declares, in his "Weekly Return," No. 30 (for this year), that "the majority of the diseases of the respiratory organs, which carry off half of those who die in London, are occasioned by the dust." (Will not some administrative reformer—some partisan of competitive examinations—put a stop to the publication of such twaddle as this?) If we, however, improve thus sensibly in our sanitary conditions without intercepting sewers, does not the question arise whether it be worth while to execute them at all? If the mere filling up the tidal ditches of Bermondsey have diminished the mortality there, would not the common sense of the question be to deepen and regularise the channel of the river, so as to get rid of the exposed mud-banks? Or, again, does not the question of disinfection force itself more and more forcibly upon us?

Emphatically we protest against the continuation of the intercepting sewer to Long Reach, or beyond Erith, on the south side. Any one who would visit the works at Leicester must be convinced that they are not, in any sense of the word, a nuisance of a nature to affect the dwellers on the margin of Plumstead Marsh. The interest upon the capital necessary to extend the sewer would far more than compensate for any commercial loss upon the sale of the manure—even supposing that such a loss should really exist. Under any circumstances, the extension would simply be a waste of public money; for it would in nowise prevent the return of the sewerage matters to London, as we hope to be able to show on a future occasion, when discussing the probable changes in the bed of the Thames—a subject, by the way, very unsatisfactorily touched upon during the necessarily unsatisfactory investigation before the New Westminster Bridge Committee.

This reminds us, however, that Sir B. Hall's very unfair attack upon Mr. Page—so, at least, it seems to us—was signally defeated; and the inquiry into the mode proposed for executing the foundations of that bridge has terminated in a manner highly creditable to that engineer, and still more creditably to the gentlemanly feeling of Mr. Robert Stephenson. The public is now entitled to inquire why the assignees of Mr. Mare's estate have been so signally favoured as they have been? and they who sanctioned the abandonment of the contract for the new bridge *before* the investigation into its principles of construction, ought now to be put upon their trial. So far as the public is concerned, this affair has terminated in the loss of a very heavy sum, in an uncalled-for attack on a worthy public servant, and in a depreciation of much valuable property.

The Smoke Nuisance Abatement Act Amendment has been ultimately accepted, as a species of compromise, by the London manufacturers, who have always felt that, both as a principle and in practical operation, the power of one of her Majesty's Principal Secretaries of State to interfere in matters strictly municipal, is dangerous and unconstitutional. The whole of the recent legislation upon this subject, we have from the first contended was unjust and illogical in the extreme; for it is far from being proved that smoke is injurious to large towns, and at any rate it is unfair to compel manufacturers to alter their machinery, made in accordance with the laws actually in force. But we may pass over entirely the question of the abatement of smoke, and yet the most immoral, discreditable nature of the portion of the 16th and 17th Vict., c. 128, will remain. We *do* contend that it is disgraceful for a government to introduce, and carry through by surprise, a measure avowedly designed for one purpose, and which by a side-wind enables its officials to effect others of far greater importance. If offensive trades require regulation, by all means let them be regulated—but by properly framed laws, by just tribunals, and by really responsible agents. To enact that, upon the information of a Secretary of State, "any person who shall carry on a trade or business which shall occasion any noxious or offensive effluvia, or otherwise annoy the neighbourhood or inhabitants," is simply to place all the trading establishments of London at the mercy of the police, and to open the door to unblushing bribery and intimidation. The manufacturers of Southwark appear alone to have seen this, and they made an effort to repeal the surreptitiously introduced clause; but it is hard to induce the present school of liberal statesmen to yield any despotic power they may possess; consequently, rather than involve the two Houses of Parliament in an unseemly dispute, the Southwark people have been obliged to content themselves with a modification of the offensive part of the Smoke Abatement Act, which at any rate destroys its moral power. In fact, however, during the discussion which took place upon this matter between the two Houses of Parliament, the Lords took up the very false position of defending a political fraud, and of violating a compromise, simply because the power given by the fraud was said "to work well."

In private bills upon sanitary subjects, little was done in comparison with former years. Bills were presented and acts obtained for the following land drainage, towns' improvement, and water-works' purposes, without, of course, taking into acconnt the Wizard-of-the-North kind of operations of the Board of Health, or the gas bills noticed elsewhere:—

Bardney Drainage	(passed)	Gravesend Improvement	(passed)
Birkenhead Improvement	(dropped)	Haslingden, &c., Water	,,
Bournemouth ,,	(passed)	Lambeth Water	,,
Cambridge University & Town	,,	Leeds Improvement	,,
Chatham District Water	(dropped)	Leeds Water	,,
Chorley Water	(passed)	Lincoln Water	,,
Clay Cross Water	,,	Middlesborough Improvement	,,
Cork Bridges & Water-works	,,	Scarborough Water	,,
Deeping Fen Drainage	,,	Scottish Drainage and Improvement	,,
Dewsbury, &c., Water	,,	Shrewsbury Water	,,
Dover Water	(dropped)	Southport Water	,,
Edinburgh Water	(passed)	Stotfield, &c., Improvement	,,
Filey Water	,,	Tormorham Water	,,
Glasgow Paving	,,	Wolverhampton Water	,,
Grand Junction Water	,,		

Or, in all, 17 water-works' acts were obtained.

We call the attention of our readers, whether connected with gas or water companies, to the report in a subsequent part of our paper, of the proceedings before Mr. Paynter in the case of the parish of St. John, Westminster, *v.* the Chartered Gas Company. Substantially, Mr. Paynter, like his colleague at Southwark, has decided against the pretensions of the newly-constituted local authorities, but on totally different grounds from those which had been allowed to prevail in the Southwark case; and really it does seem to us demonstrated by the decisions of these various police magistrates, that they constitute the very worst possible tribunal for the decision of cases involving either points of law or technical or scientific questions. But we would also ask what we are to think of the eminent legislators who drew up our recent acts of Parliament? Would any one practically acquainted with engineering have ever introduced the phrase, "mains of pipes," in the manner in which it appears in Sir B. Hall's *chef d'œuvre?* Why was not some practical engineer consulted before this nonsense was allowed to reappear on the statute-book? The "codification" school of legists reproach the common law with its obscurity and vagueness; surely the "historical" school can retort the accusation; nor would it be necessary to go further back than the legislation of the last two years to find illustrations of far worse confusion than ever actually characterised the "*lex non scripta*" which forms still, thank God! the staple of our jurisprudence. The case of Moore *v.* Webb, at the Suffolk Summer Assizes—recorded in a subsequent page—may be appealed to as a confirmation of this assertion. It proves both that the common law furnishes the means of abating real nuisances, and of protecting vested rights against the fancies of grievance-mongers.

IS THE GENERAL BOARD OF HEALTH NECESSARY?

In the discussions which have been provoked by the various measures introduced of late years, for the avowed purpose of amending the Public Health Act of 1848, the question has naturally arisen, whether the whole system upon which that act was founded were not in itself radically wrong, and whether, instead of amending the act, it would not be wiser to repeal it altogether? As this question has been seriously mooted, it behoves all persons affected by, or interested in, the proceedings of the authorities created under the provisions of that measure, calmly and deliberately to examine its bearings, in order to arrive at some definite conclusions as to whether their efforts should in future be directed towards the improvement of the system, or towards its destruction. It is said that the stability of our national government depends upon compromise; but even if this be true, so far as regards the application of principles already admitted, or the details of branches of the administration to which we have been for ages accustomed, it appears, to us at least, evident that the same argument will not apply to new principles or to new administrative organisations; and that neither should the former be admitted, nor the latter allowed to exist, unless the necessity for their recognition has been clearly demonstrated. Notwithstanding the instinctive aversion which Englishmen feel for the rigorous deductions of mere formal logic, there arise occasions on which its rules must be referred to, and even practically applied; and in the particular instance before us it is the more necessary to resort to such abstract reasoning, because passions and prejudices have been so recklessly excited, that attention has been diverted from the real principles involved, and from their contingent effects upon society in general.

The advocates of a General Board of Health—which has contrived to substitute itself for the system it was designed to regulate—base their arguments in its favour upon the existence of the evil and misery to which the poorer classes are exposed, on account of the non-observance of sanitary laws, or upon the ignorance which unfortunately prevails throughout all classes of society with respect to those laws. Incidentally it is argued that an administration of this description is required for the purpose of collecting and recording observations upon sanitary subjects; for the organisation of the efforts of such communities as are anxious to remove the dangers to which they may be exposed; and for remedying some of the defects inherent to the existing methods of obtaining the authorisation of the Legislature for the works necessary to effect the latter object, and which require that those communities should be empowered to interfere with private property. In fact, it is assumed that there are large classes of society who are unable, or unwilling, to adopt the measures requisite for their own satisfactory sanitary condition, and that it is the duty of the State to remove the evils which result from the omissions of its subjects.

Now, although every person who visits the poorer districts of large towns, whether English or Foreign, must at once recognise the awful truth of the pictures of misery, disease, and suffering so eloquently presented by Mr. Simon in the preface to his "Reports relating to the Sanitary Condition of the City of London;" but, although every right-thinking man must re-echo his earnest appeal to those who are able to remedy any portion of evils so overwhelming in appearance, it may fairly admit of discussion whether the efforts of our legislators for this purpose have of late years been directed in a proper channel. The feeling which prompts men to right at once, and by the strong arm of the law, the wrongs of those who may appear unable to defend themselves, however dangerous it may be, springs from a source so pure and holy, that there is perhaps danger in questioning the policy of its application. But it is to the full as essential that the charitable exertions of society should be directed in such wise as to rouse and direct the energies of those whom it is proposed to benefit, as it is to give vent to the kindest and noblest instincts of our nature. Far be it from us to shrink from the tale of the sufferings of the poor, or to turn aside from the investigation of the conditions of their daily life! Still it would appear, that in a question of the gravest political import, such as this is—one which may affect the happiness of our nation for generations, according as it is well or ill solved—too many appeals have been hitherto made to our feelings, whilst our reason has been, comparatively speaking, rarely, if ever, addressed. The evils, we know too well, exist around us in every direction: no one denies them, and indeed it would be wicked madness to do so. There is little danger now, that the consideration of this subject should again be cast aside, and therefore it is that we doubt the propriety of many of the recent publications of official philanthropists. It is to us a matter of regret that such talent as is displayed in those documents, had not been more usefully employed in suggesting some practical remedy for the evils they record. And in most cases, the recommendations of the authors to whom we allude, are liable to the objection that they would induce the classes whom it is desired to benefit, to shift from their own shoulders the responsibilities of their position, and to call upon society in general to obviate the consequences of carelessness and want of exertion on their own parts.

For it has been proved by the experience of all nations that, let the sufferings or privations of the poor be what they may, a systematic relief which should dispense them from the necessity of vigorous efforts to cast aside their misfortunes, will eventually result in a still lower degradation than that from which it is sought to withdraw them. Life, it is wisely ordained, is a struggle—a hard one, in far too many cases—and one in which the chances are far from being equally divided. The law, nevertheless, is universal, that happiness and physical comfort cannot be attained without labour, exertion, and self-sacrifice; and very rarely, indeed, does it occur that the depressing influences against which men have to contend are so overwhelming that they cannot be overcome. True patriots would therefore, we believe, labour rather to convince the suffering classes of our society that the major part of their privations arises from their own misconduct, or at least from the want of proper energy; and that the dependence upon society to alleviate the hardships of their lot, involves a degree of mental and moral degradation of the most fearful character. It is admitted that sanitary laws are most neglected by the poor; that their food is of the worst description; and that their dwellings are both originally badly built and subsequently badly used. The fearful death-rates of our towns are correctly attributed to the action of these causes; but, when it is borne in mind that the sober, industrious, working classes who follow avocations not injurious to health live longer than any other classes of society, it must be evident that the pecuniary position of men has only a subsidiary influence upon the duration of their lives—which latter condition may, we would add, be fairly taken to represent the degree of happiness they enjoy. If sober industrious tradesmen secure to themselves immunity from many of the ills that flesh is heir to, the inference strikes us as being plain that the best interests of society are advanced by attention to the moral education of the poor; and our efforts ought to be directed rather to teach them how to help and protect themselves, than to attempt the discharge of that function for them. We are convinced that the poorer classes of England require moral training—not sanitary laws, as that expression is now understood; or, in other words, that the best sanitary regulations are those which are enforced voluntarily by a well-educated, industrious, and self-reliant population. There ought to be no class, in a well-organised community, unwilling to observe ordinary sanitary laws: nor would there be, if a sound system of education prevailed; and it appears to us that the proper course for the sanitary reformers themselves is to urge forward the cause of education, as furnishing the most effectual means of combating the evils they so earnestly deplore. On the other hand, wherever the State has undertaken to defend those whom it assumes to be unable to defend themselves, history shows that the moral tone of the people has been destroyed. May we derive benefit from the lessons furnished by other nations (by ancient Rome, or by modern France), and still look to ourselves alone for our own protection or our own comfort!

But if we turn from the inquiry into the necessity or advisability of a state organisation avowedly designed to remove the sufferings of the poor, to the consideration of the necessity for a governmental board for the purpose of collecting and recording observations upon matters connected with sanitary laws, the very questionable utility of such a body must be apparent to those who look to facts rather than to assertions. What is there in the newly-named science of hygiene which should remove it from the sphere of its congeners, or induce us to believe that its progress can only take place under the fostering care of well-paid state officers? Other sciences have progressed alone and unaided; nay, in almost every case, they have progressed the most satisfactorily when they have escaped the withering influence of patronage or of governmental or-

ganisation—and wherein does hygiene differ from them? Indeed, the results of the attempts of the General Board of Health to advance the science it was especially designed to promote, may be appealed to as illustratiug the necessity for leaving all such pursuits to their natural course; for it would be impossible to cite an instance in which so much mischief has been done by the official promulgation of hastily adopted theories, and of false philosophy, as by this attempt at governmental organisation. Every opinion enounced by this Board of Health has been successively impugned by the most competent authorities upon the various subjects it endeavoured to grapple with; every system it recommended has been modified or abandoned; every attempt to apply its doctrines has led to failure and disappointment; until at length public opinion has consigned it to the contempt which always attends unsuccessful pretensions and unwarranted assumptions. Still it might be said that the fault in this instance lied rather in the men than in the system they have compromised—that is to say, by those advocates of the board who were candid enough to admit the extent of its failures; but the danger attached to bodies of this description is one so inevitably connected with the principles upon which they are founded, that it appears almost impossible for them to avoid a repetition of these errors, let them be composed how they may. No govermental organisation can be carried on unless upon distinctly defined principles, and according to regularly established precedents; and the tendency of all such admistrations is to subside into "red tape-ism," absolute theory, and an attention to the forms rather than to the substance of things. Even in the attempts of European governments to advance the science of astronomy, this has been proved to be the result of State interference with the exercise of the nobler faculties of our intellect; and we appeal with confidence to the contrast between the services rendered to science by the comparatively unpatronised English astronomers, and by those so carefully provided for by our French neighbours. Just as Mr. Chadwick would not acknowledge or pay any attention to any observations which militated against his theories, and kept studiously in the background those who would not support his views, so M. Arago, as far as he was able, exercised a similar repressing influence upon the French rising astronomers; and the *Conseil des Ponts et Chaussées* pooh-poohs any engineer bold enough to question the traditions they have adopted. Science of every description should be free, in order to advance satisfactorily. There is, indeed, far too great a tendency in our race to worship authority, for a true lover of humanity to desire to witness the creation of offices which should add to it the influence of station, wealth, and power, as would be done by the official organisation of scientific departments of the Government. Both upon the above *à priori* arguments, and the *à posteriori* deductions of experience, it appears to us that such boards as the General Board of Health are positively injurious to the science they are designed to advance. Certainly, the good that board has effected has been by no means commensurate with its cost, for it has settled no doubtful questions—it has discovered no fact, but rather involved all previously received opinions in doubt and uncertainty. We have had frequent occasion to protest against the nonsense thus lately promulgated at the expense of the nation; and though, since Mr. Simon has been associated with the board, its published documents have at least been written in elegant and correct language (which by some fatality was never the case during the reign of Mr. Chadwick), the reasoning or philosophy in them is still as doubtful and as liable to lead into error as in former days.

The most valid argument which has been urged in favour of an organisation similar to the Board of Health is, that there is at present no legal machinery by means of which communities can execute works of a public character without incurring great preliminary outlay for the purpose of obtaining the necessary legislative powers. Seriously examined, however, this argument simply proves that the existing forms of the Legislature are either too cumbrous or too expensive; and the natural remedy would be to induce it to examine seriously whether they might not conveniently be changed. As an abstract principle, we assert that it is by no means advisable to encourage communities to undertake the performance of duties which can by any possibility be accomplished by individuals; and therefore the power of taxing its fellow-citizens for the purpose of executing works ought only to be granted to a community when the necessity for so doing has been clearly proved before a competent and impartial tribunal. Sewerage, road-making, watching, and lighting, are admitted to be amongst the duties incumbent upon all properly organised societies. As such, every facility should be granted for their easy and economical performance at the cost of all the members of the locality concerned. But the necessity for empowering communities to execute water-works, or to make gas, is no more involved in this admission than the necessity for the establishment of public granaries, or the engagement of the State to support all its subjects. The distinction between the services which society should collectively undertake, and those it should leave to private industry, consists in this, that the former must be of a nature to be of universal benefit and of indispensable nececessity, but are not susceptible of yielding a profit; whilst the latter are only desirable, may be dispensed with, and can fairly be abandoned to private enterprise. It may be that the latter motive will not be sufficient at times to ensure the execution of such operations as the water-supply and gas-lighting of a town; but if this be the case, we may be sure that no necessity for those conveniences exists; and we hold that the community should never interfere, unless there be a positive danger in its inaction. After all, the supply of gas and water is, and may be, exclusively a commercial operation; and it ought to be a principle of conduct with the Legislature, to be as chary in granting privileges for their execution as it would be in granting facilities for any other operations of the same description. All the works to which we have above referred, are of a nature to require occasionally that private parties should be compelled to yield a portion of their rights to the public service; but it must evidently be dangerous at any time to interfere thus with private property, and it should never be done unless the necessity for such a course had been clearly proved. For our own parts, we believe that the very difficulty and expense of obtaining an act of Parliament for the compulsory purchase of property for so-called public purposes, are necessary safeguards to the most vital condition of society; and we hold that there is a great deal of spurious philanthropy in the attempt to facilitate such interferences. To create a powerful governmental organisation for the avowed purpose of so doing—of enabling, in fact, communities to avoid proving the necessity for their intended operations—seems to us, therefore, to be repugnant to all principles of sound policy, even if it be not indirectly to invite a new description of social tyranny. Let Parliament shorten its proceedings, abolish forms, and diminish the expense of private bills, as much as may be necessary; but we are convinced that it is its duty to retain in its own hands the examination, in the utmost detail, of every measure involving an interference with the rights of property; and that the establishment of any unconstitutional body for the wholesale manufacture of acts for those purposes, would eventually produce far greater social evils than any which now exist.

And thus again we ask—Is the General Board of Health necessary?

Circular to Gas Companies.

We have hitherto refrained from giving publicity to a rumour which has been for some time current, relative to the Great Central Company and its future course, so long as any doubt remained over the authenticity of the rumour; but the matter has recently become one of such notoriety in the metropolitan gas circles, that we cannot be charged with indiscretion in now referring to it.

Many of our readers will recollect that in the report submitted to the general meeting of the shareholders of that company, held on April 30th, 1852, mention was made of a new arrangement entered into with the contractor, by which he was ultimately to be paid an additional halfpenny per 1000 feet of gas supplied, of every additional candle of illuminating power above the original standard of 9½ candles. The words of the report are that—

In January last, Mr. Croll took upon himself, without instructions from us, to increase the illuminating power, so as to place his gas at a standard considerably above that which he was required to supply.

We have called in the aid of Professor Graham and Dr. Leeson, and under their advice we have raised the standard candle used in measuring the power of the gas from 131·5 to 140 grains of sperm; and we have remodelled our contract with Mr. Croll, so as to obtain from him gas of that standard ranging between 12 and 16 candles.

The contract price at present paid to Mr. Croll, 1s. 4½d. for 9½ candles, being at the rate of 1¾d. per candle; we have now agreed to pay him an extra charge of ½d. for every additional candle of illuminating power which we may require.

To enable us to give the consumers gas of this superior description, at a charge of 4s. per 1000, it is necessary that our consumption should be in-

creased to the amount which our former calculations assumed would be the amount required.

Mr. Croll's confidence is so strong that this increased demand will be realised, that he has arranged with the board that he is to be paid monthly, as heretofore, for gas up to the 9½ candles; and that he is to charge the company for the additional quantity of illuminating power which he may give, to be paid for only after the shareholders shall have been paid their stipulated dividend of 10 per cent.

The chairman, in his address to his constituents, confirmed this, by stating that—

The next matter to which he wished to call their attention was, the alteration of their contract with Mr. Croll. His original contract was to supply them with gas of the illuminating power of 9½ candles, the common standard being at that time 9 candles. The effect, however, of competition had been to raise this standard of the old companies, and it was necessary for the directors of the Great Central to raise the standard of their gas, and keep it, as it had hitherto been, above the average standard of all the gas companies of the metropolis. They were, as he had stated, bound by their contract with Mr. Croll to supply them with gas of 9½ candles only; and, therefore, they had had a long arrangement pending upon this matter, and Mr. Croll had with considerable spirit tendered to the company that he would raise the standard to 16 candles at once, asking, in the first instance, only for his present price for the 9½-candle gas, and depending for the difference of price between that and 16-candle gas until the company should pay £10 per cent.; and until then he asked for no further charge.

The new contract is, we presume, in writing, and will speak for itself in due time; but we believe Mr. Croll interprets it in such a way as to give him a claim upon the company for the immediate payment of the large sum of £20,000 for arrears up to the present time, and that proceedings have been threatened to enforce a settlement of this claim. Whether the agreement justifies such a demand we must leave the parties to it to determine, as well as to arrange between themselves who is ultimately to bear the loss of supplying the citizens of London with gas at 4s. per 1000 feet, till the mistakes of 1849 and 1850 can be rectified, and a remunerating price established. Experience has now proved, beyond the possibility of contradiction, that the price must be raised in the City of London at an early period, and the position of the Great Central Company itself will powerfully aid the settlement of the question.

The joint award of the arbitrators and umpire in the Deptford case has transpired since our last, and confirms our anticipations of its satisfactory tenour. The original award of the umpire, made on April 29, 1855, has been confirmed, and the value of the undertaking remains fixed at £20,878. The title is also declared to be unobjectionable; and each party is to pay his own costs in the arbitration, the expenses of the award being equally divided between them. As the Surrey Company were ordered to pay all the costs in the Chancery proceedings, the expenses fall much heavier on them than they do on the Deptford Company; and it is greatly to be regretted that the umpire's award was not submitted to, and all further expenditure saved. The subsequent litigation has served only to benefit those professionally engaged, by augmenting the price to the purchasers to the sum at which the property was valued by the sellers, and diminishing the assets divisible amongst the vendors to the sum originally offered.

Communicated Articles.

THE STATE OF THE WOOD-GAS MANUFACTURE IN GERMANY.

By M. Jeanneney, *of Mulhouse.*

My attention has been long directed to wood gas. It was in 1852 I first had occasion to try its illuminating power, at Basle, and I then found it very feeble. At that period a commission, nominated by the Industrial Society of Mulhouse, took into consideration the question of lighting in general; and one of the members of the commission repaired to Basle with a meter, to test the quality of the gas and to visit the works. His experiments confirmed mine. The standard of the gas was so low that, if stated, it would scarcely be believed that consumers of gas would burn it.

The following year, a manufacturer at Urach, who wished to establish a gas-work, told me that he had been to the station at Munich; that he had seen the gas tried, and had tried it himself; and that he had found it to be of a quality inferior to that of the best coal gas. It was arranged that we should go together to Heilbronn, the only town then lighted with wood gas. The following shows the result of this visit, in which we were accompanied by the director of the works. They used *fichtanholz* (a species of fir), dried on the ovens. The price of a stère* of wood was 5 francs 75 centimes (4s. 7d.); 100 kilogrammes (224 lbs.) of wood, yielded 31 cubic mètres (1094 cubic feet) of gas; the stère of wood weighed 315 kilogrammes (705 lbs.). The cubic mètre of gas cost 15·2 centimes (about 3s. 6d. the 1000 cubic feet), without reckoning interest or the capital engaged.

The purification was effected with lime-water, by means of three large purifiers, on the principle of the Archimedean screw, turned by a steam-engine. The gas, on issuing from the retorts, was collected in a gasometer, which served as a regulator, before it proceeded to the purifiers, the rapidity of the movement of which was made to vary according as the gasometer was too high or too low. The gas passed, in the first place, into two purifiers, and afterwards into a single one.

Wood from the bottom of the tree, the roots, and the small hard branches from the trunk are preferred. Those logs, which I have seen heaped up in the yard of the gas-work, are very resinous. The pieces of split wood from the "*bille*" of the tree are less resinous than others; nevertheless concreted drops of white resin are to be seen at the end of each log. An oven, containing two retorts of about 21 inches internal diameter, can produce 700 cubic mètres (24,700 cubic feet) of gas in 24 hours. The charcoal produced has little value.

The following trials of the gas took place at the hotel where we were staying. I tested the light by shadows:—

The Kind of Burner.	Pressure in Millimètres.*	Consumption per Hour in Litres.†	Power of the Burner in Candles.	Standard of the Gas.
Burner No. 5 of the gas-works of Stuttgard	25	112	1·58	1·41
Burner No. 6 ditto	23	127	3·09	2·43
Ditto No. 7 ditto	20	122	4·50	3·68
Ditto of two holes, new, at the hotel	21	136	6·01	4·42
Ditto, ditto	21½	140	6·06	4·33
Ditto, ditto	14	105	5·24	4·98
Ditto, ditto	8	83	4·62	5·56
Ditto No. 7 of the works of Stuttgard	19	124	4·62	3·72

The following year, 1854, and again in 1855, I was called upon to test the standard of the gas of Basle, in consequence of disputes with several manufacturers. An inquiry was being prosecuted to ascertain if the price at which I sold gas to four manufacturers of Basle should not be reduced. My contract with them was to this effect:—"Article 4. M. Jeanneney shall deliver to the manufacturers the gas they may require at the rate of 1 fr. 40 c. the cubic mètre (32s. 4d. the 1000 cubic feet). The quality of the gas supplied shall be such that a burner of 22½ litres shall give as much light as four candles like those of which 10 kilogrammes are deposited with M. J. F. Sarasin."

That gas was made from grease. I now produce it from a mixture of Boghead cannel and coal. Since that time, the above-mentioned manufacturers continue to burn my gas, for which they still pay 1 fr. 40 c. the cubic mètre, the quality of the town gas being such as not to compel me to reduce my price.

In 1854 I visited, at Lambach, in Austria, a manufactory where they have a gas-work for making wood gas for 250 burners. I was not permitted to test the gas. The following are the only particulars that I gathered:—

The burners consume 158 litres (5½ cubic feet). It is said they give the light of from 14 to 16 candles of eight to the pound—the candles not being snuffed during the experiments. The gas costs, without reckoning interest on capital, 12·2 centimes the cubic mètre (2s. 9d. the 1000 feet). The fuel for heating the retorts is lignite, which costs 92 centimes per 100 kilogrammes. There are three retorts to one fire. Each retort is about 19 inches wide, and nearly 8 feet long. The charge is 56 kilogrammes (125 lbs.) of wood. The retorts are charged every hour and a half when the wood is well dried, and every two hours when it is moderately dry. 1000 kilogrammes (2240 lbs.) of lignite are consumed in twenty-four hours in heating the oven; a single one is sufficient. The charcoal is sold readily to smiths, braziers, and tinmen, who pay for it 1 fr. 80 c. the hectolitre. The wood distilled is *fohrenholz* (a species of fir). Very resinous wood only is used; it costs 5 fr. 65 c. (4s. 6d.) the stère. The purification takes place by means of a purifier, on the principle of the Archimedean screw. That does not, however, give satisfaction, and it is about to be replaced by a purifier of dry lime. The wood produces 22½ cubic mètres (800 cubic feet) of gas per 100 kilogrammes. It is admitted that the purification is a matter of great importance, and that if the process be not carefully conducted, the gas burns very badly. The *regenerator* is still employed in this gas-work: it is acknowledged that it does not improve the quality of the gas, but only produces a larger quantity.

In October, 1854, the town of Zurich, on the establishment of its gas-works, made several stipulations, one of which was, that a gas burner consuming 127 litres of gas in the hour should give the illuminating power of 14 candles of five to the pound. The cause of this stipulation was, that it was stated in the report of the gas-work of Basle that the gas which professed to have an illuminating power of 10 candles per 127 litres had, nevertheless, that of 14 candles. I competed for the gas lighting of Zurich, but in my tender I did not engage for more than 10 French candles per 127 litres. The contract was, consequently, not given to me; and M. Riedinger now conducts the undertaking, having assumed the responsibility of supplying wood gas of the required quality. From that time I determined to institute an inquiry into the quality of the wood gas of the different towns in Germany which have adopted it between 1853 and 1855, but I had not time to pursue the investigation myself. Without believing it possible to make pure wood gas richer than that of coal, my doubts

* A measure of wood equal to a cubic mètre, or 35·316 cubic feet English.

* 25·4 millimètres are equal to an English inch.
† 100 litres are equal to 3·5316 cubic feet.

were excited, for I thought that the contractor for the supply of Zurich would not guarantee gas of so rich a quality without having good ground to rely upon.

In the month of February, in the present year, I saw at St. Gall a manufacturer of that town, M. Lafont, a skilful chemist, formerly a pupil of M. Mallet, and well acquainted with the subject of gas lighting, who assured me that after the experiments he had made himself in the gas-works constructed by MM. Dollfus and Riedinger, he had no doubt that the latter would be able to complete his engagements with the town of Zurich. My curiosity was then raised to the highest degree, and I did not hesitate to send an engineer belonging to my establishment to test the wood gas of all the towns of Germany in which it was made. The following are the results of this tour of inspection:—

GAS OF THE GREAT SPINNING MILL OF AUGSBURG.

There were here 800 burners. The purification was effected by lime water, with Archimedean screws, which only acted as agitators. This arrangement did not give satisfaction, and it was proposed to replace it by dry lime.

The gas contained from 8 to 9 per cent. of carbonic acid.

In the experiments that were made, the methods of measuring the intensity of the light by shadows and by images were adopted alternately. I exhibit the results obtained by both processes. (*See table.*) One year (1854—1855) gives the following results:—

581 stères of wood distilled, at 6 fr. 5 c.	3,580 fr.
Repairs and motive power	1,560
Labour	2,870
34·60 cubic mètres of lime	898
658 stères of wood for heating the retorts	4,530
	13,438
Deduct charcoal sold	3,020
67,800 cubic mètres of gas produced, at 15·4 centimes .. (equal to 2,394,424 cubic feet at 3s. 5d. per 1000 feet).	10,418

GAS AT THE RAILWAY STATION AT MUNICH.

The wood distilled is *fohrenholz*, taken from the trunk of the tree. The stère of wood costs 6 francs 15 centimes; the wood is well dried upon the ovens. The railway company pays the contractor 43 centimes per cubic mètre for the gas (about 9s. 8d. per 1000 cubic feet). The purification is effected with dry lime.

According to a table posted up in the works, 100 kilogrammes of wood (224 lbs.) should produce 22·20 cubic mètres of gas (783 cubic feet), 20 kilogrammes of charcoal (45 lbs.), 30 kilogrammes of wood-vinegar, and 5 kilogrammes of tar. This table is also posted in other works, and the same figures are repeated in the circulars of the inventor, Professor Pettenkofer. The charge of the retorts is 45 kilogrammes (100 lbs.), and it is renewed from hour to hour. This gas contains 18 per cent. of carbonic acid! The experiments were twice repeated before the clerk. (*See table.*)

GAS OF BAYREUTH.

Two ovens with three retorts each, and one oven with a single retort. The gas is made with chips of wood split from the trunk of the *fohrenholz*, which is well dried on the ovens; 100 kilogrammes of wood yield 26·60 cubic mètres of gas (940 cubic feet). The purification is effected with dry lime. The retorts are heated with coal from Zwickau, which costs 2 fr. 17 c. per 100 kilogrammes (about 10d. per cwt.). The retorts are charged with 45 kilogrammes of wood. Every charge remains in the retort one hour and a half. The gas passes through 10 sieves of 10 layers of lime, each one being one-tenth of a mètre thick (about 4 inches). The wood costs 2 fr. 30 c. per 100 kilogrammes (11d. per cwt). Three years ago it cost only 1 fr. 85 c. The charcoal is sold for 6 fr. 15 c. per 100 kilogrammes (1s. 8d. per cwt.). One hectolitre of charcoal weighs 9 kilogrammes (20 lbs.). The wood-vinegar sells for 96 centimes per kilogramme. It is said that the cubic mètre of gas costs 10·3 centimes (2s. 3d. per 1000 cubic feet). The gas is sold to the town for 56 centimes the cubic mètre (12s. 6d. per 1000). This gas contains 3 per cent. carbonic acid. (*See table.*)

COBOURG.

There are 180 town lamps, and 1400 private burners. There is one oven with three retorts, one with two, and two with a single retort each. The charge is 46 kilogrammes of wood; it remains half an hour in the retort. The wood used is the *kieffernholz* (also a species of fir), which appears exactly to resemble the *fohrenholz*. The purification is by dry lime. The gas passes through 20 sieves. A single kilogramme (about 2¼lbs.) of lime in powder, moistened, purifies 0·85 cubic mètre of gas (30 cubic feet). The lime is of bad quality; it costs 2 fr. 65 c. per 100 kilogrammes. There are two gasometers, each containing 335 cubic mètres (about 12,000 cubic feet), before which there is placed another, containing 10 cubic mètres, which served as a regulator, with the Archimedean screw purifiers; but this gasometer and the screw have been laid aside, to substitute the mode of purification with dry lime. The wood-vinegar is collected in large reservoirs, from which it is made to run into large vats, heated by the waste heat of the ovens. Lime is put into these vats, and it forms an acetate of lime, which is heated to dryness. This acetate is sold for 21 francs the 100 kilogrammes (8s. 4d. per cwt.), and it is used for making acetic acid. The charcoal is sold for 6 fr. 70 c. per 100 kilogrammes. The town guarantees 5 per cent. interest to the shareholders. Private consumers pay 52·3 centimes per cubic mètre (11s. 8d. per 1000 feet). Each retort can produce 10½ cubic mètres (400 cubic feet) of gas per hour. (*See table.*) This gas contains 3½ per cent. of carbonic acid.

WURTZBURG.

There are 400 town lamps; 300 private burners; magnificent works; the same system as at Cobourg—three ovens, each with three retorts. Each oven might produce 40 cubic mètres (about 1500 cubic feet) of gas per hour. The charge is 56 kilogrammes of *kieffernholz*, which is renewed every three quarters of an hour. The wood costs 8 fr. 90 cents. the stère; 100 kilogrammes of wood produce 31· cubic mètres of gas (1100 cubic feet). The purification is effected with dry lime. The gas passes through ten sieves, on each of which there is a layer of 0·10 mètres (4 inches) of lime. There is a washer which operates with an Archimedean screw as *exhauster*. One kilogramme of lime purifies 1·12 cubic mètres of gas (about 2½lbs. for 40 cubic feet). Acetate of lime is made as at Cobourg. The retorts are heated with coal, mixed with the charcoal that comes from the retorts. There are two gasometers, of 800 cubic mètres each. The gas is tested every day in a dark room, and a register is kept of its quality. This register stated generally that a burner passing 31½ litres of gas (1·15 cubic feet) gives the light of five candles. The director asserts that that is the fact: it is nevertheless incomprehensible. The gas is sold to private consumers at 56 centimes per cubic mètre (12s. 6d. per 1000 cubic feet.) (*See table.*) This gas contains 3 per cent. of carbonic acid.

DARMSTADT.

There are 500 town lamps. The system is the same as that of the three preceding. There are three ovens, each with three retorts, and a fourth oven is about to be constructed. The wood distilled is common fir. The production of gas from 100 kilogrammes of wood is, on an average, 25 cubic mètres. They prefer to use the wood of old trees. The cost of 100 kilogrammes of wood is 2 fr. 55 c. There are two gasometers, each containing 715 cubic mètres. Each retort can produce 8·60 cubic mètres of gas per hour (300 feet). 450 kilogrammes of coal are burned every 24 hours for heating each oven of three retorts. Private consumers pay for the gas 63 centimes the cubic mètre (14s. the 1000 feet). There is an exhauster, serving also as a washer, and put in motion by a steam-engine. It draws the gas into the dry-lime purifiers. This gas contains 1 per cent. of carbonic acid. It is to be remarked that old wood only is distilled, because it has been found that it yields more gas, and produces much less carbonic acid. It is probable that in this experiment and in the following, some obstruction occurred in the copper tubes of the meter on which the burner was fixed, because there is an anomaly between the expenditure of gas and the pressure. In other respects this accident does not affect the final result; the only effect of it is that the pressure under which the two last experiments were made is not known. This anomaly was perceived too late to be corrected. (*See table.*)

HEILBRONN.

Admission could not be obtained into this gas-work, and no particulars could be procured respecting the actual make of gas. Private consumers pay 44 centimes the cubic mètre (10s. per 1000 cubic feet). This gas contained 2½ per cent. of carbonic acid.

TABLE REFERRED TO IN THE FOREGOING STATEMENTS.

Places, and Character of Burner.		Pressure in Millimètres.	Consumption in Litres per Hour.	Power of the Burner. Shadow.	Image.	Standard of the Gas.
Spinning Mill at Augsburgh.						
Burner of 200 litres, at 7 millimètres		7	119	2·92	2·85	2·42
Slit burner of the mill	*b*	24	228	7·50	7·49	3·28
The same slit burner	*b*	7	129	—	5·25	4·06
Station of Munich.						
Slit burner, pattern from the works	*b*	12	85	3·24	3·30	3·85
Burner of 200 litres, at 7 millimètres		12	80	2·77	2·70	3·41
Another slit burner from the works	*b*	22	170	—	7·00	4·11
Bayreuth.						
Burner of 200 litres, at 7 millimètres	*b*	10	150	5·30	5·20	3·54
,, ,, ,,	*b*	12	155	5·43	5·50	3·51
Cobourg.						
Burner of 200 litres, at 7 millimètres	*b*	150	11	7·00	7·00	4·67
,, ,, ,,	*b*	144	9	6·25	6·50	4·42
,, ,, ,,	*b*	135	7¼	5·66	5·50	4·13
Wurtzburgh.						
Burner of 200 litres, at 7 millimètres	*b*	12	152	7·20	7·50	4·84
,, ,, ,,	*b*	9	143	7·05	7·50	4·92
,, ,, ,,	.	7	134	5·76	6·00	4·40
Darmstadt.						
Burner of 200 litres, at 7 millimètres	*b*	14	120	6·00	6·00	5·00
,, ,, ,,	*b*	9	80	4·00	3·50	4·70
,, ,, ,,	.	7	60	3·14	2·50	4·70
Heilbronn.						
Burner of 200 litres, at 7 millimètres	*b*	12	110	5·65	5·50	5·05
,, ,, ,,	.	10	100	5·06	4·50	4·78
,, ,, ,,	*b*	8	95	5·70	4·50	4·84

The testing-meter employed in the foregoing experiments was that of MM. Siry and Lizars. The candle was kept constantly at its *maximum* of light by snuffing the wick. The candles used in the experiments consumed 9½ grammes of stearine per hour (146 English grains).

The noting of the experiments was not commenced until about 30 litres of gas had passed through the meter, so as to expel the old gas; and means were taken to ascertain before beginning that the quality of the gas continued the same. The quantity of carbonic acid was gauged by a test-tube with caustic potash.

The burner of 200 litres, mentioned in the experiments, was one consisting of two jets, of the kind called the *Manchester burner* (union jets). With coal gas, this burner consumes exactly 200 litres per hour, under a pressure of 7 millimètres of water.

The *fichtanholz*, the *fohrenholz*, and *kiefernholz* appear to be the same kind of wood, bearing different names, according to the localities from which it comes; it is pine wood—the tree of the great forest of Haguenau.

The regenerator was a retort divided into four compartments, in which the gas, on leaving the retort charged with wood, traversed four times the length of the oven, in contact with red-hot surfaces. The use of this apparatus has been generally discontinued, because it adds too much to the cost of the working, and has not an adequately useful effect.

There are two other towns in Germany lighted with wood gas, viz., Pfortzheim and Gotha. It was from the want of sufficient information that the gas made there was not tested in the course of the same investigations.

The gas-works are in general very well fitted up; it may be said, even, that they are luxuriously so.

During the first and second winters, grease and Boghead were used at Basle to improve the quality of the gas. I am not positive that in 1854 and 1855 they were still used, though mentioned in the official documents.

During the tour of inspection, the gas of Bamberg, which is made from coal, was tried. The standard was found to be 6·10 for a burner consuming 123 litres, under a pressure of 10 millimètres. The authorities of the town make the gas, and sell it to private consumers at the rate of 43 centimes the cubic mètre (9s. 7d. per 1000 feet.)

To determine the standard of the gas, I established the following rule:—The distance of the shadow of the candle was first adjusted in such a manner that the ratio of the squares of the distance should be 7½. We were then certain that the power of the gas-burner was that of 7½ candles. Afterwards different burners were mounted on the meter; and, when the gas was lighted, the stop-cock was closed or opened until the two shadows were equal. The pressure should then be 7 millimètres. If it were less or greater, the burner was changed until one was found which fulfilled the condition of giving the light of 7½ candles, under a pressure of 7 millimètres. The burners were those of two jets. The exact pressure of 7 millimètres was, however, never attained; and we were contented with an approximation to it of between 6 and 8 millimètres. When everything was well adjusted, the consumption was reckoned, and the pressure was also noted at which the shadows became equal. I recommended the adoption of this course for testing the wood gas; but that could not be done, because no burner could be found sufficiently large to give the light of 7½ candles with a pressure of 7 millimètres.

It may be remarked in all these experiments, that at an equal pressure a much smaller quantity of wood gas passes through a given burner than of coal gas. From this it appears that that gas is much more dense than gas from coal; and this excess of density arises principally from the carbonic acid. It is not only in the experiments of the last tour of inspection that this remark was made. In the experiments of 1853, on the gas of Heilbronn, the Stuttgardt No. 7 burner was so large as to be almost inadmissible for coal gas. It consumed 175 litres of coal gas under a pressure of 7 millimètres. The burner of the hotel of Heilbronn is the same as my burner of 200 litres.

At Basle two phenomena occurred, which clearly proved that wood gas is excessively dense:—

1. Before coming to one-half the contemplated number of burners, the pipes proved insufficient. It has been alleged that the number of burners exceeded the provision made for their supply; but that could not be so, since there has been no change in Basle for two years. The manufactories which are there at present have existed for five years. The contractor, M. Dolffus, could not have been deceived as to the requisite diameters of the pipes, because, in the first place, he is too skilful an engineer to have made such a mistake; and, in the second place, before he lighted Basle, he had lighted two large towns, Stuttgardt and Nuremberg, where there has been no complaint of the insufficiency of the pipes. The excessive density of the wood gas is the only cause of the pipes of Basle being too small. It is known that the more dense a fluid is, the greater is the loss of pressure in flowing through a pipe. Thus it was found necessary last summer at Basle to set up a large gasometer at the extremity of the town most remote from the gas-work, and it was filled during the night, when the manufactories were closed.

2. The gas-work at Basle is situated in the highest part of the town, and the contractor declared that he could not make the gas reach to the lowest part, called *St. Alban's Hole;* therefore the town lamps were not set up there. Nevertheless, coal gas reaches that place readily, and many factories established there could be supplied with it after the second winter. This is an additional proof of the density of wood gas.

The German journals have for three years past re-echoed the praises of wood gas, and the *Gazette d'Augsbourg* recently published an article which presented that gas in a most favourable point of view. I do not say that those praises are not merited; for, after all, wood gas will be very useful in many localities until they can be supplied with coals at a cheaper rate. But all those articles have been written in a manner to produce an erroneous impression on foreign readers. It is to be observed that no report of the experiments mentions the consumption of the candle; and it is known that the German candles are much smaller than ours. They are fully five to the pound, and they are very long. Further, the thickness of the wick may be different from ours; and on that, more than on the thickness of the candle, the illuminating power of the light depends. We snuff the wick, and they do not, which makes a further difference of 12 per cent.

Indeed, if it should be proved to me that, in experiments where skilful *savans* and professors have verified the illuminating power of wood gas, they used candles exactly like ours, and that they have always found this gas possess more illuminating power than that of coal, I should still be of opinion that in practice it would not be so. On attending a commission, the gas for the experiments is made with greater care than can be always maintained. The proof of it is in the results of the multiplied experiments I have cited, all made *ex abrupto* on the ordinary gas produced every day. I have cited all the experiments I have made on wood gas, except those of the first winter at Basle. I have not omitted any; and I have given the results, such as they were presented, with or without anomaly. I have tested this gas by the same processes that I had previously employed in thousands of other experiments on coal gas and on other kinds of gas. Whatever my results may be, they may be compared with what we know of the quality of other gases. The absence of the means of comparison with the data of science is what I object to in the experiments that have hitherto been made on wood gas. Now, however, the wood gas, such as it was in Germany in the month of February last, is known. It may be still asked whether, in the course of time, the process of manufacture might not be so improved as to raise the standard of wood gas. It would be imprudent to reckon upon such improvement, for chemical science has been applied this subject for five years. But we should reason on the existing state of things; and I will now inquire what price, according to the preceding data, we ought to pay for wood and for coal, to place both substances on an equality in the manufacture of gas. The numerous experiments I have made with common coal gas authorise me in stating its standard to be 7. The average of the experiments made by Mr. Lewis Thompson on the gas of all the gas companies of London, day by day, from June 9, 1852, to Feb. 9, 1853, represents the standard to be 8·15; but the burner he used had the power of 11½ candles, which increases the standard of the gas. If I were to state the results of my multiplied experiments on the gas at Mulhouse, it would seem that the gas during two years was generally above 7. To arrive at the standard of wood gas, I have taken the average of all those experiments to which the letter *b* is attached in the foregoing table. This average is 4·68; a number which is to 7 in the ratio of 2 to 3. Thus experiment does not authorise us to admit that gas made from wood is more than two-thirds as rich as coal gas.

(*To be continued*)

VICAT'S THEORETICAL AND PRACTICAL TREATISE UPON THE COMPOSITION OF MORTARS, CEMENTS, &c.

(*Continued from page* 370.)

Slacking.—All limes, when taken fresh from the kiln, or within a short period after their calcination, and thrown into water, burst with an explosion, swell and fall into a paste, giving off, in so doing, heat which produces a description of ebullition. This phenomenon takes place in a variable manner with the different kinds of limes; and is, generally speaking, more decidedly marked in the cases of the rich than in those of the hydraulic limes. Slacking effected in this manner M. Vicat designates by the term of "ordinary slacking;" and, according to the proportion of water used, the English workmen designate the hydrates thus obtained by the names of *slacked lime*, when only the quantity of water absolutely necessary to effect that change is present, or *run lime* when so much is used as to reduce the lime to a fluid state. Rich limes swell in thus slacking to a much greater extent than the hydraulic limes: the former frequently yielding a paste from 2 to 2½ times the volume of the material operated upon, whilst the latter will only increase in volume from 1 to 1¼. Generally speaking, 1 cwt. of pure rich lime will yield about 4¼ cubic feet of stiff paste, when fresh from the kiln, or about 3½ cubic feet, if the lime be old and impure. The densities of hydraulic limes vary between such wide limits, that it is dangerous to quote any figures with respect to them.

If limes should be slacked, however, by merely dipping them for a few seconds into water, and withdrawing them before they assume the pasty character, they hiss, burst with noise, give off vapour, and fall into powder; the same circumstances occur if they should be only sprinkled with water in the heap. Under any circumstances, it is advisable to cover up the lime, so as to concentrate the heat thus evolved, because it facilitates the slacking and reduction to powder; and when thus reduced, the limes do not again evolve heat upon a second application of water. On the first dosing in this manner, the rich limes retain from 18 to 20 per cent. of water (in bulk); the hydraulic limes retain from 20 to 30 per cent.; and this mode of slacking may be designated by the name of

"slacking by immersion, or aspersion." In some places, the lime is covered with damp sand directly it has been thus operated upon, in quantities sufficient for two or three days' use.

If a certain quantity, in weight, of rich lime be reduced to a thick paste by the process called by M. Vicat the ordinary slacking, it will present a volume which will bear the proportion of 100 to 58, when compared with the volume of a similar weight slacked, reduced to powder, and reworked. It follows from this that two equal volumes of lime paste, of the same consistence—prepared, one by the ordinary mode of slacking, and the other by aspersion or immersion—will contain quantities of quick-lime in the ratio of 100 to 161, and quantities of water in the ratio of 100 to 93. These differences may also be observed with the hydraulic limes, but they are less distinctly marked, and they vary with the quantities of clay they contain; and it would also follow from these observations, that slacking in the *ordinary* way, or under water, breaks up the lime most effectually, and allows the expansion to take place under the most favourable circumstances. If, however, during the operation the water should fall short in any portion of the basin, the lime will slack into a dry powder; and if, in order to obviate this inconvenience, cold water be added, the lime checked in its evolution of heat will fall into a species of curds, which will remain in the paste, and injure its qualities to such an extent as to be seriously objectionable when it is intended to be used for whitening walls, or for what are called rendering coats.

There is a third mode of slacking, which is so seldom resorted to that it need here only be mentioned cursorily: it is known by the name of *natural* slacking, and is the process by which the lime, kept under cover, absorbs moisture and carbonic acid gas from the atmosphere; upon their absorption the limes fall into powder, but their qualities are essentially modified. A rich lime, obtained from stones, broken to about the size of an egg before being put into the kiln, would require not less than three months to slack in this manner. After that time, 100 parts of the powder would contain from 10 to 11 parts of water, and from 26 to 27 parts of carbonic acid; or would constitute sub-carbonates, in which the caustic lime would be, in proportion to the acid, as 630 : 265; or it would contain about half the acid required for the complete saturation of the lime. When the natural slacking has reached this point, the rich limes make better mortars, with sand, than when artificially slacked; but the slowness of the process renders it practically inapplicable. With the hydraulic limes, however, natural slacking destroys the peculiar properties they would otherwise possess.

M. Vicat recommends a system of slacking lime for building purposes to which it may be desirable to call the attention of London builders, who, as a general rule, are singularly unskilful in the use of the blue lias or other hydraulic lines. M. Vicat advises that two basins should be sunk in the ground and made water tight. The quick lime should then be spread in layers of between 8 and 10 inches thick, and these layers covered with water successively, in proportion to the absorption of the lower strata; that is to say, the upper layers should not be added until the lower ones have taken up their full dose of water. Care should be taken that every particle of the lime should thus receive its full dose, and should not slack in the air; but that the whole mass should be reduced to a uniform thick paste. No more lime ought to be thus slacked at one time than is required for one or two days' consumption, for the paste loses its ductility after a prolonged maceration in the basin, and would not be able to be converted without the addition of a second quantity of water. It is in order to avoid any inconvenience from this cause that M. Vicat recommends the formation of two basins, so that the lime may at all times be slacked at least 15 hours before being used, which would suffice to compensate for the inequalities in the rate of slacking, and allow the mortar to be made up regularly.

However well a kiln may be managed, it is impossible that the lime should be entirely free from portions unequally burnt, or of a different composition to the remainder of the material. These heterogeneous particles do not slack in the same manner as the remainder, and are known to workmen under the name of "*core;*" some of them, when powdered, act like ordinary lime; some of them slack more slowly, and act like the cements; whilst some of them are totally inert. On account of the difficulty in the selection, it is, however, necessary to reject all the core; for the difference in the periods of its setting would ruin any good work. The practice of grinding the hydraulic limes, so commonly resorted to, is objectionable for the same reasons; indeed M. Vicat does not hesitate to stigmatise this practice, as affording the means for "adulterating" limes; and on this score we commend the examination of the subject to Dr. Hassell and his friends.

After the slacking has been completed, the limes require to be reduced into a paste, for the purpose of receiving the sand necessary to bring them into the condition usually employed in the arts of building. Pure lime is rarely employed, unless it be for the purpose of whitening walls; and for this use it is important that they should be brought into the state of a very fine paste, free from curds. The chalk limes are usually selected for such purposes, on account of their whiteness; and they are usually slacked, or run, with so large a quantity of water as to form, in fact, milk of lime. Mortars, however, require the addition of sand to the lime, in proportions varying with the composition of the respective ingredients themselves, and with the uses to which they are subsequently to be applied.

Sands.—Common sands, which are furnished by the decomposition or the mechanical destruction of the older rocks, when free from earthy impurities, and of a sharp angular grain, do not exercise any chemical influence upon the solidification of mortars within appreciable periods of time; the size of the grains, on the other hand, notably affects the degree of hardness the mortars may subsequently attain. There are some descriptions of volcanic sands, and decomposed volcanic or plutonic rocks (to which attention will hereafter be called), able to influence both the rate of setting and the ultimate hardness of the mixtures to a remarkable degree. Of the inert sands, those obtained from pits are usually purer and sharper in their grain than river sands, especially when they have not been much rolled previously to their deposition.

Mortars; Rich-Lime Mortars.—The proportions of the lime paste and sand which usually are admitted in the preparation of mortars of this description are, 1 of paste to 2 of sand—the ingredients being measured in bulk. But, whatever mode of slacking may have been employed, the proportion of sand may vary within the limits of between 19 to 24 parts to 10 of the paste, without producing any perceptible difference in the resistance of the mortars; the most essential condition to be observed is, that the sand should be of moderate dimensions, and of a sharp, angular nature. So far as regards the strength of the mortar, it appears that the most advisable mode of slacking is by aspersion, or immersion; but the quantity of lime thus used is greater than when the lime has been run into a paste. Mortars of this description gain considerably by being reworked; but although they may be adapted to certain positions, they are utterly worthless in those where they are exposed to the direct action of water, or even to that of the atmosphere. For external work, rich limes should never be used; but if from local circumstances it should be found necessary to employ them, the proper system of manipulation is to reduce the limes, slacked into powder, to the consistence of a thick firm paste, and only to add water when the sand is extremely dry. Let them be prepared, however, as carefully as they may, the mortars made with rich limes can never attain a greater degree of coherence than 42½ lbs. upon the square inch.

Hydraulic Lime Mortars.—It must not be supposed, from the name applied to this material, that its use is exclusively confined to masonry or brickwork exposed to water; on the contrary, the circumstances under which it renders the greatest service are those where it is employed in buildings exposed to the variable action of the atmosphere, and it is in such positions that the hydraulic lime mortars attain their greatest degrees of hardness. Thus the moderately hydraulic limes attain finally a degree of cohesion equal to about 127·71 lbs. on the square inch; the eminently hydraulic limes to a resistance of 212·85 lbs.; whilst the limes of the latter category, in which the silica predominates, attain a cohesion of about 241·23 lbs. on the square inch, when exposed to the ordinary atmospheric influences. The same mortars, kept continually under the ground, or in water, do not attain the above resistances; for their cohesion in the former case, when compared to their cohesion after exposure to the atmosphere, is usually in the ratio of 7 to 10, and in the latter of 6 to 10.

The limes for these mortars—slacked, as before described—are to be mixed with the sand either under edge-rollers, by the pug-mill, or by hand; and the smallest quantity of water possible should be added in this part of the process. The best proportions are about 18 of sand to 10 of the paste of lime, measured in bulk; but they may be varied to a considerable extent without inconvenience. If the mortar should be required to be used under a great depth of water, it is advisable to use from 1-6th to 1-5th more than the usual proportion of lime, and to make the mortar as consistent as possible by the use of the rammer. If, on the contrary, the mortar should be required for the purpose of rendering exposed walls, a greater proportion of sand may be used; for, although the ultimate cohesion may be diminished by so doing, the resistance to the effects of frost will be increased. The nature of the sand does not appear to have much influence upon the resistance of the mortar, provided that its grain be palpable, firm, and hard, and that it be not too large. The mode of slacking with large doses of water, in the manner above described, does not affect the resistance of the hydraulic lime mortars in the same manner that it does the resistance of the rich limes; but, on the contrary, it increases the cohesion slightly when the mortars are applied in the open air, and to a very marked extent when they are applied under water. For this reason, Vicat recommends that the slacking of the hydraulic limes should always be effected with full doses of water, rather than by reducing the limes to powder; but he dwells with great force upon the necessity for presenting merely the quantity of water required to keep the lime in the state of a tenacious paste during the whole of the operation of mixing it with the sand. In direct opposition to the practice of English engineers and architects, he asserts that the system of grouting is decidedly objectionable, so far as the strength of the mortar is concerned; and that the resistance of a mortar so treated, when exposed to the air, is diminished about 50 per cent., and, when constantly immersed, about 30 per cent. With mortars prepared as M. Vicat recommends, it is essential that the stones or bricks used in conjunction with them should be kept constantly wet—a precaution too much neglected by our builders.

Concrete.—In the execution of concrete it is desired, properly speaking, to cause the mortar to perform the same function with respect to the stones, gravel, or irregular masses introduced, which the lime performs in respect to the sand in the mortar itself. The only indipensable conditions to be observed in the selection of these stones and other materials are, that they should be hard, able to resist frost, and that their size should not exceed the dimensions of road metal. The quantity of hydraulic mortar required to unite these materials will be that necessary to fill the voids naturally produced by the compression of the materials when abandoned to themselves, or about one-half of the volume of the loose stones; the mortar should be equally distributed throughout the mass, and the whole well and carefully compressed by the rammer, or by any of the other systems in general use. It is in the execution of large bodies of concrete under water that the greatest precautions are required to be observed in the preparation and application of this material; and perhaps the formation of the third graving dock of Toulon, described by M. Noel in the *Annales des Ponts et Chaussées*, vol. xxviii, 1850, may be referred to, as presenting its most remarkable application. In this instance, the concrete for the floors and side walls was commenced in 50 feet depth of water; and the whole body of the work was executed of that material, nothing but the altars and the exposed surfaces of the dock being formed of dressed stone. The reader is referred to M. Noel's notice upon the subject for a description of the precautions observed to secure the impermeability and the solidity of the mass; and also to another notice in the same publication, of the date Nov. and Dec. 1851, by M. Beaudemoulin, containing an account of the manner in which he had executed several important works under nearly similar circumstances. We are so little in the habit of employing large masses of concrete formed with hydraulic limes in this country, that it appears desirable to call attention seriously to its advantages; and therefore we propose, on some future occasion, to devote an article to the discussion of this important branch of engineering. M. Vicat states, it may be sufficient here to add, that it is essential in all such works to avoid disturbing the concrete after its solidification has been once effected; and also to remove the filmy milk of lime which detaches itself from the exposed surfaces, and accumulates in any hollows or depressions between the various layers. The French engineers at the present ay lower the concrete, prepared with a slight excess of lime, in order to compensate for the removal of the soluble portion, by means of close boxes made to open when under water.

"*Extreme Limes and Cements.*"—M. Vicat describes, under the term *chaux limites* (which we have translated *extreme limes*), a class of materials presenting some peculiar properties. When the argillaceous limestones contain more than 20 per cent. of clay, it will be found that ordinary calcination will not reduce them to the condition of quick-lime, but that such stones will yield two strongly defined classes of products. One of these, if placed under water (in the lump), will remain unaltered for several days, or even weeks, without giving any indications of slacking; ground and worked up in the same manner as plaster, it sets at first, but it breaks up, or falls into mud, if placed under water. M. Vicat calls this description of materials the "extreme limes," because they are found directly the proportions of clay necessary for the composition of the hydraulic lime have been passed; and they occur, when the clay is present, in the proportion of from 20 to 23 per cent. of the whole mass. The other class of products M. Vicat ranges under the name of cements; and he states that they are obtained when the proportion of clay ranges between 23 and 40 per cent.: but the best cements, according to him, are those in which the clay forms 30 per cent. of the whole mass—although, of course, the quality will depend, to a great extent, upon the chemical composition of the clay, and upon the manner of burning. Cement stones, generally speaking, are burnt like ordinary limestones, but they require more care, and that the heat should not be so intense. The lumps, as they leave the kiln, do not slack or effervesce under water; and it is necessary to treat them in the same way as plaster—that is to say, to reduce them to a fine powder, and mix them with a certain quantity of water immediately before applying them, because they harden almost instantaneously, either in the open air or under water. Their colours are very various—light or dark brown, grey, nankin, light yellow, &c.—and they, together with the rapidity of their setting, as well as their ultimate hardness, depend upon numerous circumstances, to which attention will be called in a subsequent article. M. Vicat observes, that some limestones are found in which gelatinous silica exists, in the proportions which are supposed to be most favourable for cements, but which it is impossible to convert into that material; and he also adds, that the addition of from 6 to 12 per cent. of magnesia, to the ordinary proportions of the silicate of alumina, renders the cements better for all marine building.

M. Vicat gives the following analysis of the cements used in France, and he calls attention to the fact that they contain, in many cases, a large proportion of sulphur—a fact of which hitherto no notice had been taken in the analysis of these materials. He touches slightly upon the influence of the degree of calcination upon the cements to be obtained, and still more slightly upon the manufacture of artificial materials of this class from a mixture of chalk and clay. We would here observe, that it is to be regretted that M. Vicat should not have been able to study the manufacture of Portland cement, because that valuable material is precisely obtained from the calcination of an artificial mixture of chalk and clay, burnt at times to a commencement of vitrification.

Substances.	Urrugy, Natural.	Portland, artificial.	Butte Chaumont, Paris.	Portland, Boulogne.	Vassy.	De l'Yonne.	Vitry le Français.	Medina.	Fouilly.	Boulogne, Natural.	Cahors.
Lime	63·44	62·05	62·04	61·75	59·50	58·077	55·70	43·45	49·600	49·283	44·45
Magnesia	1·11	traces	2·371	traces	traces	6·80	traces	13·93	..	2·582	4·80
Inert matters	..	..	..	1·00	..	..	..	..	..	4·300	..
Silica	22·75	22·50	22·765	25·10	17·75	20·887	20·00	19·50	26·000	28·000	26·00
Alumina	8·75	9·50	8·254	7·25	6·60	8·000	9·77	5·60	10·000	9·575	12·15
Peroxide of iron	3·75	3·85	4·370	4·50	7·35	3·436	4·83	12·05	5·100	5·726	5·50
Carbonic acid	..	} 3·10	..	..	3·80	..	{ 4·00 2·60	} 2·50	7·200	..	4·58
Water	..										
Alkaline substances	..	0·80	..	0·40	..	..	3·50	2·15	1·19	..	1·20
Sulphuric acid	0·20	1·20	traces	..	5·00	2·80	0·20	0·80	0·850	0·514	1·32
Proportions of clay to lime	0·51	0·46	0·54	0·52	0·41	0·65	0·53	0·90	0·72	0·81	0·96

The sulphuric acid to which M. Vicat alludes does not appear to produce any fatal effects until it exceeds the proportion of 5 per cent.; but it is always objectionable, and produces a tendency to crack, or even to fall to pieces, after use.

(*To be continued.*)

Correspondence.

THE PRESTON GAS-RATING CASE.

SIR,—I have just observed, in your JOURNAL of the 8th of July, a reference to myself and my "Treatise on Gas-Works," in connection with the recent appeal in the Preston gas-rating case.

You say that the overseers, guided by a report from me, fixed the assessment at £4254; and that the gas company, relying on an estimate of rateable value in my treatise, objected to this amount. You go on to observe that, applying the principle of my valuation to Preston prices of coal, residual products, and gas, the rateable value would be reduced to £2100. I must be allowed to say that I object entirely to this inference being drawn from anything I have written. On the contrary, had the case come on for hearing, I was prepared to show that my principles of rating, applied to the Preston gas case, would raise the rateable value to more than double the price you have mentioned; or, in other words, to the amount at which the company was assessed by the parish.

I contend that, according to the only legal mode of rating—namely, that prescribed in the Parochial Assesement Act—this rateable value can be established whether one takes as a basis the productive power of the works, or the company's own account of revenue and expenditure as deposited with the Clerk of the Peace under the Gas-Works' Clauses Act.

I take this opportunity of expressing my gratification at the fairness and candour with which you admit that the principles adopted by the magistrates of Preston in Petty Sessions *are not in accordance with the Parochial Assessment Act.*

In fact, the mode of rating which the magistrates adopted, being founded as structural value, is directly at variance with some of the most important and best-known judgments. Lord Denman has repeatedly said, "*Cost is no measure of rateable value;*" and, when closely examined, it will often be found that an excessive original cost or outlay in the works is an element or reason for *reducing*, instead of increasing, the rateable value. Suppose the case of two separate establishments, no matter whether railway, gas, or water-works, one of which is of a structural value, amounting to £100,000, while the other is worth £500,000, and suppose the net revenue from each to be the same, it is clear that the one which has cost the most, and which has the heaviest and most costly works, must be assessed at a less sum than the other, because its works will cost more for renewal and depreciation. But, on the other hand, the principles adopted by the Preston bench, instead of rating it at less than the other, would simply cause it to be rated at *five times* the amount. The absurdity of such a principle will be evident in this example; and so it will be whenever applied to an extreme case, and tested in this manner.

I quite concur in your opinion of the two modes of rating which have been suggested, the one by Mr. Pridden, of the Phœnix Gas Company, and the other by Messrs. Baxter Rose and Norton. Both of these modes being arbitrary, and bearing no relation to the net annual value of the works, are highly objectionable; first, because they are at variance with the mode of rating every other description of property; and, secondly, because in many cases they would be very unjust to gas companies themselves. If they were fair to companies deriving a good income from their works, they would be grossly oppressive on others deriving only a very small income in proportion to expenditure.

I think some of your own remarks point clearly to the true and only relief which the companies would be wise to seek for or expect. The principles of the Parochial Assessment Act are, in my opinion, sufficiently broad and comprehensive to embrace the true mode of rating every kind of property; but these principles seem to require another act of the Legislature to clear up some difficulties which have been met with in assessing gas-works and some other descriptions of property.

The wording of this act, and the mode of rating which it prescribes, involve the fiction of a tenant—that is to say, the valuer must assume a tenant occupying the works from year to year, and

must apply his skill and judgment to ascertain what that tenant will give for the occupation.

It is conceded by all valuers on both sides of the question that the assumed tenant is entitled to interest for his floating capital, and to a certain payment or remuneration for his superintendence, and these allowances operate as deductions from the rent which he will give for the property.

The great question in dispute has always been whether the retorts, meters, and gasholders of a company are to be considered rateable property, as in the notice of tenant's stock in trade, on which he is to be allowed interest as on his capital.

In most cases with which I have been connected, the gas company has conceded the rateability of the gasholders, contending only that retorts and meters should be treated as stock in trade. At the same time, there are decisions of the superior courts which justify the rating of meters.

As I understand from your observations, that you are in favour of carrying out the principles of the Parochial Assessment Act in rating all descriptions of property, I would submit to you whether it would not be most to the interest of gas companies, and most satisfactory to all parties concerned, to procure, if possible, a definitive legal settlement as to the property which is really rateable, and whether certain parts of gas-works and the apparatus connected therewith are to be treated as rateable property or as tenant's stock in trade.

There is an act passed every session of Parliament for the purpose of exempting from assessment the profits of stock in trade, and it is highly important to know what description of property is included under this term.

The fact is, the difference that would at the present moment be made by two extreme partisans—one rating for a parish, and the other for a gas company—would probably be reconciled, or nearly so, if they could agree on the mode of treating the meters—whether as stock in trade or as rateable property. Hence, it seems the settlement of this point would go far to remove the discrepancies and disputes which at present prevail in opposite valuations.

I would suggest, in the interest of the gas companies, that their objects will be best gained by a legal settlement of this question; and, without expressing any opinion as to the precise mode in which it should be settled, I think we must look in this direction for a proper solution of the difficulties which at present beset the subject of rating these works. SAMUEL HUGHES.

14, *Park Street, Westminster, July* 26, 1856.

PURIFICATION BY HYDRATED OXIDE OF IRON.

SIR,—On my return to London, I have just seen Mr. Laming's statement in your last number, which I shall take no further notice of than to say, I am quite aware that Mr. Laming and I shall never agree as to what he calls facts, and which I call mistakes. As I shall shortly have to establish my rights in a court of law, I shall not trouble you with any other communication on this subject, or take any notice of any *ex parte* statements which the writer will, no doubt, make to suit his own case, and to answer his own purpose. F. C. HILLS.

Chemical Works, Deptford, Aug. 1, 1856.

FERTILISING PROPERTIES OF BOGHEAD CHARCOAL.

SIR,—Since I last addressed you, on the fertilising properties of Boghead charcoal as a manure, and its use in rendering greenhouse plants almost free from the attacks of the greenfly, I am glad to state that four dozen of my calceolarias, six rose-trees, and the remainder of my greenhouse plants, with only one exception, have been free from their attacks. Some of those plants, however, given by me to other persons, and placed in the midst of other plants which were covered with greenfly, had greenfly on them in a week or ten days after their removal. The Boghead charcoal plants, however, were not destroyed by them, as was the case with the other plants, and the greenfly appeared very unsettled, roaming about on them. In the above instance, the situation of the Boghead charcoal plants was similar to a healthy person sleeping and feeding with a number of unclean people in a confined and dirty room, where, in a short period of time, he would be attacked by the same insects which fed on their personal uncleanliness. A putrescent soil and certain conditions of the atmosphere predispose certain plants to disease and the attacks of insects, the plants throwing off, through their leaves, &c., an albuminous excrement, which is the excess of azotised matter taken up by their roots, and not assimilated by them, thereby attracting insects to them, who by instinct select such plants to lay their eggs on, knowing that they contain an abundant store of food for their young in their juices and on their leaves.

The same plants, however, grown in Boghead charcoal soil, obtain a due proportion of carbon and silica, the former contributing to an increase of chlorophyle, flowers, and volatile oils, and the latter to firmness and strength in their cuticles. Putrescent matters in the soil are neutralised by the antiseptic properties of the charcoal, and moss will not grow in the pots where it is mixed with soil. Putrescent manure heaps attract insects to them, where they feed and propagate, as proved by the millions of them which are to be seen in those localities where such heaps are placed, which is not the case where there are heaps of charcoal. The *acari* found in brown sugar, and which cause the grocers' itch, feed on the albuminous matter contained in it. No *acari* are found in loaf sugar, which is free from albuminous matter. Thousands of ants were seen in a dark heap of unrefined sugar, and fed on the albuminous matter until consumed by them, when they left the carbonaceous part of it in a clear state.

My experiments lead me to conceive that, were there no putrescent matters in the world, insects would nearly be extinct, as, without them, such scavengers of Nature could not exist. When the atmosphere contained a larger quantity of carbonic acid gas, and plants thereby obtained a larger proportion of carbon than they do now, vegetation on the earth, at that period, was far more luxuriant and healthy. If cleanliness is next to Godliness—and if, of late years, education, science, &c., have promoted sanitary measures in this country, and freed the cleanly portion of the community from the tormenting attacks of insects—why should not sanitary measures, when pursued with regard to vegetation, be attended with equally beneficial results to plants, and free them also from the attacks of insects? Were sanitary measures more appreciated by the Russians, would it be necessary for them to purchase above 30 tons of flea-powder annually?

Having found, last year, that my best melons were those grown in manure mixed with coal tar, I have tried further experiments with it. My method is, to mix the tar with manure when heaped; and, in preparing the hot-beds for cucumber and melon plants, to pour on every six-inch layer of manure put into the frame some coal tar, at the rate of two gallons for each plant; on the surface of the manure from nine to twelve inches of soil is placed, and then mixed with one or two shovelfuls of Boghead charcoal. To those who have had their cucumber plants diseased, I would recommend the above experiments, feeling convinced, from the fine-flavoured cucumbers grown by me, and the large, healthy foliage of my plants, that disease, where prevalent, would be prevented. Cultivators, of late years, from an anxiety of gain, have been induced to over-stimulate certain plants by a constant use of putrescent manures, in order to increase their amount of produce, forgetting that, without a due portion of antiseptic carbonaceous matter with such manures, such plants are predisposed to disease and the meteorological changes of the atmospere. My dahlias, last year, were in a great measure destroyed by the wire-worm; this year, however, by the use of Boghead charcoal in the pots, and in the soil where they were finally planted, they have been so healthy, and their juices rendered so unpalatable, that the wire-worm has not attacked them.

If, as stated, plants have negative electricity at their roots, and positive electricity at their leaves, an increase of carbon in the soil must, from increasing the amount of carbon in some plants, render them better conductors of electricity, and, consequently, conduce to their healthy growth; whilst, on the contrary, an excess of albumen in them, from their growth in a putrescent soil, renders them bad conductors of electricity, and the albumen becomes more readily decomposed, by an excess of ozone, in a warm, moist atmosphere. The concentrated state of oxygen in ozone, in its action on a Boghead charcoal, is, I believe, to hasten decomposition, and furnish plenty of carbon to vegetation; hence it does good where an antiseptic carbonaceous manure is used. I have on former occasions stated diseases in the vine and potato prevailed more in the immediate neighbourhood of the sea-coast than inland, which I cannot but consider to be connected with the action of ozone on such plants, grown in a putrescent soil. Ozone, on the sea-coast, is nearly always in excess, and the sea-shore always being low, there is always a large amount of moisture in the atmosphere near it. All the above accumulating coinciding causes appear to me to exert important influences on vegetation. As the results of my experiments with the ozonometer here may be interesting, I beg to state them to you. In September, 1855, an ozone paper, which I elevated on a mast 70 feet high, indicated for four or five days from 5 to 6 of ozone, whilst another paper, 15 feet high, during the same period indicated no ozone. This year, on several occasions the ozone papers, elevated at different heights, indicated the least amount of ozone at the greatest height, and the greatest amount of ozone at the lowest height, as follows (ozonometer 0·10):—

70 feet	.....	6·0	ozone	....	9·0	ozone	.... 6·50 ozone.
45 „	.....	7·0	„	....	8·0	„	.... 8·0 „
15 „	.....	8·0	„	....	10·0	„	.... 8·50 „
6 „	.....	9·0	„	....	10·0	„	.... 9·0 „

Ozone in moderation, in a pure atmosphere, I conceive does good, but its excess where there are heaps of animal and vegetable matters, &c., is fatal to man and certain vegetation. In the former case, it is like a wine glass of brandy taken in a tumbler with pure water; and in the latter case, like a large quantity of brandy taken in a tumbler with sewerage water. As, some time past, I stated I considered that coal tar, when made into an asphalt, and used in streets, &c., in towns, would, from the hydro-carbons given out by it, and its prevention of putrescent damp exhalations rising from the earth, be found to mitigate the ravages of cholera, I shall be glad if any of your Sheffield subscribers would state whether, during the time of cholera there, it prevailed most in the highest or lowest localities, and if those people who lived in those parts of the town where the coal tar asphalt was laid in the streets and footpaths, were more or less exempt from its attacks. JOHN MALAM.

Holmpton Lodge, July 26, 1856.

THE BITUMINOUS SHALE, OR "PAPER COAL," OF RHENISH PRUSSIA.

SIR,—The coaly resources of Great Britain have been declared to be practically inexhaustible, and therefore it must be a hopeless task to solicit attention in this country to the carboniferous productions of our neighbours, except perhaps as a means of instituting a comparison calculated to gratify our national vanity. Nevertheless a day *must* come when coals will be "carried to Newcastle;" and the day has already come in which one particular kind of coal begins to give warning that the word "inexhaustible" is, after all, but a "figure of speech." In plain terms, cannel coal is rising in price every day; and, if the employment of cannel gas continues to extend, many now living will witness the beginning of that epoch which, sooner or later, must transfer the element of British greatness to the hands of others, and fairly "cut our steam off."

It may not, therefore, be amiss to look around us and examine the resources of those who have anything to offer; and in this respect the article whose name I have quoted at the commencement of this letter is worthy of a serious consideration. This substance (for I cannot call it coal) is extracted from the George Mines of the Bonn Mining, Mineral, Oil and Candle Company, which at present yield it at the rate 15,000 tons per annum, but are said to be capable of very considerable extension. The workings are now carried on by means of a day-level and four shafts, without steam-power; but a steam-engine is in course of erection, which will materially enlarge the production; and it is confidently asserted that this mineral can and will be delivered in the Thames at 18s. per ton; consequently, we may soon expect an alteration in the state of the cannel coal market.

The substance itself has a singularly foliated structure, and in some parts may be split into flexible leaves as thin as paper. These leaves, or layers, have still the dark olive-green hue of *chlorophyle*, and exhibit a black waxy streak on being scratched. The interstices of the leaves are filled with earthy matters, and the entire aspect of the material conveys the idea of a vast number of successive layers of a small floating vegetation swamped, so to say, one upon each other at different periods, and separated by thin deposits of mud derived from turbid water. Shakspeare has spoken of "the green mantle of the standing pool," and my first impression on seeing this new substance was, that it consisted of an innumerable series of these "mantles," from which the greater part of the ligneous matter had been washed away as humus, and nothing but the *chlorophyle* or waxy covering left. In this view, it would be "young cannel coal," or coal minus the effects of age and compression. Viewed as a mass, it bears the most striking resemblance to the well-known Boghead coal—a resemblance which is much increased by chemical investigation, as I will presently show. Its specific gravity, when taken after exhaustion in water under the receiver of the air-pump, is 1·250; but it is extremely difficult to separate the whole of the air from its numerous pores; and hence specimens of it may be had which actually float in water before being exhausted of their air. It contains much moisture, and on an average loses 16·8 per cent. by drying at a steam heat. The amount of its volatile and fixed constituents are as follow:—

Volatile matters	67·
Fixed matters	33·
	100

The amount of ash is 26·2 per cent., and this consists of silicate of alumina, with a little lime and oxide of iron. The amount of sulphur is 1·25 per cent. Distilled at a low red heat, it affords excellent lubricating oils, and much paraffine, both of which are capable of being purified very easily. At a bright cherry-red heat it yields, per ton, from 10,200 to 10,500 cubic feet of gas of a very superior kind. This gas has a specific gravity of ·754, and contains 25 per cent. of matters condensible by bromine. The specific gravity of the condensible portion is 1·207. When burnt at the rate of $2\frac{1}{2}$ cubic feet per hour in a No. 2 fish-tail cannel burner, the purified gas gives a light equal to 16·75 standard spermaceti candles, each consuming 120 grains per hour.

The total impurity in the foul gas is 6·5 per cent., and consists chiefly of carbonic acid. The amount of carbonic oxide in the purified gas is 5 per cent.; and no doubt much of this, and also of the carbonic acid, is derived from the large quantity of water in the substance.

It now remains for me to say what this substance is. When boiled with a solution of potash, it gives a dark brown fluid containing humic acid; hence, in my opinion, it is not a true coal: and again, when distilled at a low red heat, it affords an aqueous liquor, from which acetic acid may be extracted: I shall call it, therefore, a "cannel lignite," until a better name is found for it.

In conclusion, I must add that I have been greatly assisted in this investigation by my friend, Mr. F. J. Evans, whose great practical experience has enriched this communication with a degree of interest to which otherwise it would have had no claim.

LEWIS THOMPSON.

Register of New Patents.

193.—GEO. BROOKS PETIT and HENRY FLY SMITH, of Oxford Street, in the co. of Middlesex, gas engineers, for "*Improvements in gas-heating apparatus.*" Patent dated Jan. 24, 1856.

[This is an invention which consists in the modification and application of a burner already known, for the purpose of burning a mixture of air and gas. It would be quite impossible to describe it in detail without reference to the illustrations, which amount to no less than 146.]

229.—SAMUEL JABEZ GOODE, of Aston, near Birmingham, in the co. of Warwick, machinist, for "*A new or improved gas-stove.*" Provisional protection only obtained. Dated Jan. 28, 1856.

This invention consists of a gas-stove in which the gas is burned, and the heated air and products of combustion made to circulate in the following manner:—The gas is allowed to escape from a jet or burner into a metallic chimney, the top of which is closed with wire gauze. The gas mixes with the air in the said chimney, and the inflammable mixture is ignited above the wire gauze. The said chimney is situated in a conical flue, up which air from the apartment circulates; the said flue opens into a chamber constituting the body of the stove, into which said chamber the heated air and products of combustion pass, and from which the air, after having partly given up its heat to the said chamber, may either enter the room or pass off by means of a flue. Instead of making the flue in which the burner is situated conical, it is preferred to make it cylindrical, when it is wished to conduct the products of combustion out of the room. In this case, the heated air arising from the combustion impinges against the closed top of the cylinder. The top of the cylinder separates the body of the stove into two compartments. Air from the room may be supplied to the upper compartment by means of tubes; and the heated air, rising, may be impeded and partially deprived of its heat by means of a perforated diaphragm in the upper part of the stove.

265.—HENRY RENDER, of Manchester, in the co. of Lancaster, merchant, for "*A new or improved lubricating material.*" Provisional protection only obtained. Dated Jan. 31, 1856.

This invention consists in the substitution of a fatty body not hitherto used for lubricating purposes, in all such situations and for all such purposes as tallow is now commonly employed, particularly for preventing or reducing the friction of shafts or their bearings in general mill-work and manufacturing machinery; also the pistons of steam-engines and other such machinery. This new or improved lubricating material is denominated "palmatine," which is the harder or more consistent part of palm oil left as residuum in the processes of preparing the oil. For other purposes, the application and use of this material for lubrication being entirely novel, and a more economical substitute for tallow.

266.—FREDERICK KERSEY, of 5, Laurie Terrace, St. George's Road, Southwark, for "*An improvement in the manufacture of drain-pipes.*" Provisional protection only obtained. Dated Jan. 31, 1856.

This invention has for its object an improvement in the manufacture of drain-pipes. For this purpose, each length of drain-pipe is formed with two half-sockets—one at each end, and on the same side of the pipe—by which, when laying down a drain, the alternate pipes will have their half-sockets downwards on the bottom of the trench, and the other alternate pipes will have their half-sockets upwards; by which means the pipes may be taken up without breakage, and each pipe will have more uniform bearing at its two ends than when each pipe is made with a half or whole socket only at one end. Such pipes may, as heretofore, be made with junctions with half-sockets.

270.—JOHN HENRY JOHNSON, of 47, Lincoln's Inn Fields, London, and of Glasgow, N.B., gentleman, for "*Improvements in gas-burners, and in regulating the combustion of gas.*" Patent dated Jan. 31, 1856.

This invention relates to certain improvements upon modifications of the burners and regulators for which letters patent for Great Britain were granted to the patentee on or about the 3rd of February, 1853, whereby such burners and regulators are rendered of more simple construction, and more effective in use.

According to this invention, in place of boring out two converging chambers in a metal cap, to form the two burners, it is proposed simply to insert two of the ordinary Manchester burners, with their upper ends slightly converging in a metal cap, which forms the main or double burner composed of the two single Manchester burners which are fitted therein, the flames or jets of which are made to meet and combine a short distance above the main burner. An air passage may or may not be left between the two burners to increase the brilliancy of the light, and otherwise improve the combustion of the gas. The regulator, according to one modification, consists of a small metal disc hinged to one side of the lower mouth or entrance of the main burner, which is notched slightly at the side to admit of a certain amount of gas passing into it, even should the regulating-valve be closed or forced by the pressure of the gas against the mouth of the burner, otherwise the light would be extinguished. Below the regulating-valve is screwed a disc, having an opening in the centre sufficiently large to allow the requisite supply of gas to pass through. This disc serves to adjust the amount of opening of the valve, which, when open, rests upon it at one side. By screwing the disc up or down, it is evident that the regulating-valve will be rendered more or less sensitive to the pressure of the gas. Above the regulator is fitted a wire gauze disc, for the purpose of thoroughly dividing or separating the gas into innumerable small streams before issuing from the burners. Wire gauze may also be applied to the apertures at the bottoms of the chimneys of gas-burners, for the purpose of dividing the air before getting within the chimney, and feeding the flame, whereby a greater brilliancy of light will be obtained.

Another modification of regulator consists of two discs placed one above the other inside the burner, a space being left between the upper and lower disc, which is larger, with a round opening; and the lower disc, with a triangular opening, the latter opening being smaller than the former. When the pressure is too great, the lower or small disc is elevated, and pressed against the upper disc; which latter, being grooved radially on its under surface, allows a certain quantity of gas to pass through to the burner, but not so much as will pass through when the lower disc is only slightly elevated, and the two discs are not in contact.

The claim is for—

1. The peculiar modifications and arrangements of gas-burners, as hereinbefore described.

2. The peculiar constructions and arrangements of self-acting gas-regulators, as hereinbefore described.

3. The application and use of wire-gauze discs, for the purpose of dividing the gas immediately before it issues from the burners.

PROVISIONAL PROTECTION

GRANTED BY THE DEPOSIT OF A COMPLETE SPECIFCATION.

1504.—DAVID WHITE, of 3, Winchester Place, in the parish of St. James's, Clerkenwell, in the co. of Middlesex, surveyor, for "*Improved apparatus for the more perfect combustion of gases, for preventing their escape, and the unnecessary radiation of heat therefrom.*" *June* 26, 1856.

1601.—WILLIAM YOUTMAN, of Southampton, gentleman, for "*Improvements in valves and plugs.*" July 8, 1856.

1641.—GENERAL HENRI DEMBINSKI, of Rue Joubert, No. 8, in the City of Paris, for "*An apparatus giving a self-acting motive power, produced by weight, elasticity, compressed water, or any gas whatever.*"

1660.—WILLIAM CLIBRAN and JOSEPH CLIBRAN, of the City of Manchester, machinists and manufacturers of gas-regulators, for "*Improvements in apparatus or mechanism for regulating and measuring gas.*" July 15, 1856.

1665.—JOHN HENRY JOHNSON, of 47, Lincoln's Inn Fields, London, and 166, Buchanan Street, in the City of Glasgow, N.B., for "*Improvements in apparatus for consuming smoke, to be applied to lamps and gas-burners.*" July 15, 1856.

1712.—RICHARD ARCHIBALD BROOMAN, 166, Fleet Street, in the City of London, patent agent, for "*An improved method of supplying air to gas and other lights.*" July 19, 1856.

1732.—CHARLES COWPER, of 20, Southampton Buildings, Chancery Lane, London, for "*Improvements in lighting and extinguishing gaslights.*" July 22, 1856.

NOTICES HAVE BEEN GIVEN OF INTENTION TO PROCEED WITH THE UNDERMENTIONED PATENTS.

873.—ANTOINE PERPIGNA, advocate, of Paris, for "*Improvements in the manufacture of coke.*" April 11, 1856.

1250.—BENJAMIN NADAULT DE BUFFON, of 13, Rue du Cherche Midi, Paris, and of 4, South Street, Finsbury, London, *ingénieur en chef du Gouvernement*, for "*A new apparatus for clarifying and purifying water and other liquids.*" May 26, 1856.

1504.—DAVID WHITE, of 3, Winchester Place, in the parish of St. James's, Clerkenwell, in the co. of Middlesex, surveyor, for "*Improved apparatus for the more perfect combustion of gases, for preventing their escape, and the unnecessary radiation of heat therefrom.*" June 26, 1856.

LIST OF PATENTS WHICH HAVE BECOME VOID

THROUGH THE PATENTEES NEGLECTING TO PAY THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

820.—WILLIAM JOHNSON, "*Improvements in apparatus for the manufacture of gas and coke.*" April 5, 1853.

837.—EDWARD LANGDON BRYAN, "*Improvements in warming and ventilating rooms and buildings.*" April 7, 1853.

844.—GEORGE FREDERICK GOBLE, "*Improvements in safety-valves for steam-boilers and gas-chambers.*" April 8, 1853.

923.—JOSEPH DUNNING, "*An improvement in the construction of coke ovens.*" April 16, 1853.

924.—JEAN MARIE SOUCHON, "*Improvements in the manufacture and purification of gas for illumination, and certain products therefrom, and in apparatus for that purpose.*" April 16, 1856.

965.—WILLIAM ROBJOHN, "*An improved meter for measuring and indicating the measure of liquids.*" April 21, 1853.

1047.—OLIVER P. DRAKE, "*A new or improved apparatus for vaporising benzole, or other suitable volatile hydro-carbon, and mixing it with atmospheric air, so that the mixture may be burnt for the purposes of illumination or otherwise.*" April 29, 1853.

1064.—FRANÇOIS MONTFRANT, "*Improvements in lubricating materials.*" May 2, 1853.

1197.—WILLIAM JOHN WARNER, "*Improvements in dry gas-meters.*" May 14, 1853.

1237.—SAMUEL WRIGHT, "*Making a gas, steam, air, or liquid, safety-tap.*" May 19, 1853.

1273.—JOHN HENRY JOHNSON, "*Improvement in the construction of pipe and other junctions.*" May 23, 1853.

Legal Intelligence.

SUFFOLK ASSIZES.

IPSWICH, JULY 29 and 30.

MOORE *v.* WEBB.

Mr. PRENDERGAST, Q.C., Sergeant WELLS, and Mr. BURCHAM, counsel for the plaintiff; Sergeant BYLES, Mr. O'MALLEY, Q.C., and Mr. COUCH, counsel for the defendant.

The plaintiff, Mr John Kirby Moore, is the occupier of Holyoak Farm, in the parish of Combs, near Stowmarket. The defendant, Mr. Webb, is the owner of the well-known tannery in the same parish. The question at issue was to try the right of the defendant to turn the foul water from the tannery into the stream which passes through the plaintiff's meadows, whereby, as alleged, the water is polluted, and rendered useless for cattle, and a great and increasing nuisance has been created. It was admitted that the foul water from the tannery has always passed into the stream; but then it was contended that since the plaintiff took the farm, some 30 years ago, the evil, which was then trifling and endurable, has, in consequence of the increase of the defendant's business, grown up to be of intolerable magnitude. The plaintiff, it was added, had repeatedly complained, and the defendant had devised various contrivances, including the sinking of an artesian well, and the construction of sluices, in order to provide a remedy.

The principal evidence was given by Mr. *John Kirby Moore*, who stated that he was steward to Lord Ashburnham. He held a farm at Badley, and another at Combs; the latter had been in his occupation 36 years. When he first became tenant of Holyoak Farm, the stream of water was exceedingly good, and fit for the use of his cattle. In 1842 the cattle began to refuse the water, in consequence of its increasing foulness. The stream continued gradually getting worse until 1849, caused by the refuse waters from the tannery. Mr. Webb had been the occupier of the tannery as long as he could remember. In the year 1849 he first made a complaint upon the subject of the stream, hoping that something would be done by way of remedy. Mr. Webb was very civil, and seemed anxious to do what he could; but plaintiff believed nothing was done. In the following year he had a second interview with Mr. Webb; and it was about this time that Mr. Webb said he had it in contemplation to sink an artesian well, which it was represented would produce a large quantity of water to be turned into the stream in order to cleanse it. On the 6th of August, 1851, he called again, when Mr. Webb and Mr. Fraser walked with him through the meadow, and something was said by the defendant about the necessity of clearing out the water-course. At the latter part of 1852, or the beginning of 1853, Mr. Webb applied to him for permission to lay a pipe-drain through his ground, for the purpose of carrying away the tannery filth. To this application plaintiff said he could not give permission without the consent of Lord Ashburnham, which was in consequence asked for and granted. The filth continued to be poured into the stream down to June, 1853, when plaintiff once more called upon Mr. Webb, in consequence of nothing having been done to remedy the nuisance so frequently complained of. He remembered writing a letter to the defendant in September, 1853, renewing his complaint; and on the 22nd of October, in the same year, he wrote another letter, stating that after what had passed he was surprised to find a repetition of the nuisance, adding, that if he did not hear from Mr. Webb, there was but one conclusion he could come to. On the 13th of April, 1854, he had another interview with Mr. Webb, when the latter said he wished it could be settled one way or other, as it was inconvenient to be spoken to so often on the subject in the market, when he had other business to attend to. On the 20th of April plaintiff took a memorandum, recording that the water was offensive, and he made similar memoranda as to the discoloured and stinking condition of the water in June and July, 1854; also in August, 1855, and at later dates. Sometimes the water was not so bad as at other times, but the cattle would never hardly drink it, "except now and then." There were three sluices. The two lower ones were erected in 1852. The filthy water sometimes ran over the sluices and discharged into the stream. Before these sluices were erected, the water from the tannery flowed in a continuous stream, but since then the water was kept back; and, except when the sluices were opened, the stream ran pure again, as it had done since this action was brought. The smell of the tannery water was dreadful in warm weather. Up to 1842 there was nothing came down from the tannery in the summer, except when there was a thunder storm; in fact, the water-course was dry for two or three months together. About the time stated, some new buildings were erected at the tannery, much more extensive than those previously existing. Since then there had been a great additional flow of filth; and from this he judged that the business had increased. The consequence was, that frequently in the autumn, cattle feeding in the meadows had to be taken a quarter of a mile to be watered; and since 1849 he had never been able to turn cattle in to feed at all in the spring and summer.

Cross-examined by Sergeant BYLES: He had no recollection that Mr. Webb ever offered to make drinking-places for the cattle. Mr. Webb had talked about it, saying there would be no difficulty. He would swear, to the best of his knowledge, that no such offer had ever been made. He had never made a complaint about the smell; he might have said that he did not care about it, when spoken to on the subject yesterday, as it was the water for his cattle that he wanted. Plaintiff remembered the defendant's father having the tannery; he did not remember the grandfather, but as long as he had known the place it had always been a tannery.

Evidence was given in corroboration by *Samuel Young*, stockman on the farm, who, in reply to Mr. O'Malley, stated that the stream had been in good condition since the 29th of May.

Edmund Cunnold, a resident in the vicinity, stated that he formerly used the water, when it was very good. He had tasted it lately, and it had a very bad taste and a very bad smell.

Sergeant WELLS: What colour was it?—Sometimes black and sometimes lilac.

Which do you like best—the black or the lilac? (A laugh.)—Neither the one nor the other.

Did you ever try them mixed?—No, that I didn't.

Mr COUCH: What induced you to taste it when it was so black?—Because I had a mind to try its quality.

Were you ever told to keep an account of the water?—I have kept a journal, by request of Mr. Moore, since last May.

The witness produced the book, containing his observations from time to time as to the state of the water. On the 20th of May it was better than he had seen it for many years. On the 22nd, 27th, and 29th, it was of a very bad colour and smell, but it had been better ever since, no water from the tannery having passed since the 29th. (The reading of these entries caused a good deal of merriment.)

Among other witnesses examined to prove the increasing deterioration of the water was an old man named *Wright*, who, in reply to Mr. O'Malley, stated that it was always very bad when there was a flood to bring down the filth from the tannery, but of late years it was worse than it used to be.

Mr. PRENDERGAST: Why?

Witness: Because more filth comes down at a time.

What is the cause of that?—Tanks and sluices have been built; and, when the sluices are drawn, it comes down in a bigger body than before.

The JUDGE: Was it always called the "Tannery River?"—I never heard any other name for it.

Mr. PRENDERGAST: Where was it called the Tannery River?—Against the yard.

And what was it called in Mr. Moore's farm?—The Run of Water.

The remainder of the plaintiff's case consisted principally of corroborative evidence as to the increased foulness of the water, consequent upon the extension of the defendant's business.

Mr. *Thos Denny*, of Ipswich, formerly the owner of the tannery, stated that he sold it to Mr. Webb in 1842 for £800. In reply to Mr. Byles, he stated that his grandfather occupied the tannery.

Sergeant BYLES: Have you your grandfather's will?

Witness: I have my great grandfather's will.

Sergeant BYLES: Produce it, then.

The will was put in, and the Judge's associate was about to read it, when Mr. Prendergast objected.

An argument ensued, and the JUDGE decided that the will could not be shut out.

That portion of the will was then read relative to the demise of the tannery from the testator to his son, grandfather of the present witness.

The JUDGE: Is that the property that was sold for £800?

Witness: Yes.

Sergeant BYLES: Did you tell Mr. Webb that he was not to increase his business?—Of course not.

Mr. PRENDERGAST: He didn't tell you that he was going to double it?—No, he did not.

In the course of the case, bottles of water taken from the stream at three different points were handed in, and their turgid appearance caused some merriment in court. The witness, Mr. *T. F. Wood*, stated that he accompanied the plaintiff to take the samples on Sunday.

Sergeant BYLES: Did you carry a stick?—I did.

Did Mr. Moore carry a stick?—He did.

Will you swear that you didn't put your stick into the water?—I will.

Did Mr. Moore put his stick in?—He did. (A laugh.)

What sort of a stick was it?—Well, I should say that he took it on purpose. (A laugh.)

Sergeant BYLES: So I thought. (Laughter.)

Counsel for the plaintiff proposed that the bottles should be opened in court, that the jury might have olfactory demonstration of its offensiveness.

The JUDGE: Your witness says that it stinks—do you believe him or not?

Sergeant BYLES suggested that the jury should retire, and have the bottles opened in another room. (A laugh.) He should have no objection to their being opened, provided he could get samples of the water twenty years ago.

Joseph Green, another of the many witnesses called to prove the condition of the water, said, years ago it used to smell, but it was worse now—it "stunk." (A laugh.) Sometimes it was white and frothy, sometimes black, and sometimes other colours. It was clear at the present time, and on Saturday last he saw a man drinking out of the stream.

Mr. *Webster*, surgeon, Ipswich, stated that on the 25th of April he took three bottles of water from the stream; one nearest the tannery, and the other two at more distant points. He analysed them, and found that they differed very materially in foulness. The specimen taken near the tannery was dense, the second not so dense, and the third, though clear and transparent, smelt very offensive, like bilge water. It yielded, on analysis, a small trace of tanning. Cattle might drink the water at the most distant point if the bottom were not disturbed; the stream, however, was very shallow, and the disturbance of the bottom sent up a quantity of black offensive matter. Some of the water at the middle point was offered to a horse, but it would not touch it.

Sergeant BYLES, before going into the case of the defendant, submitted that the plea as to the trade having been carried on from time immemorial, had been proved; and that, as there was no proof of a single drop of water having been used for any other purpose than the purposes of the trade, there was no evidence to go to the jury under the new assignment.

Mr. PRENDERGAST and Sergeant WELLS argued against.

Sergeant BYLES was heard in reply.

The JUDGE said he should be extremely sorry to bring this cause to an abrupt conclusion if he entertained any doubt upon the question, but he thought the objections raised by Sergeant Byles were sustained; but there was no evidence to show any use of the water, except for the purpose of tannery; therefore a verdict must be given for the defendant.

Mr. PRENDERGAST intimated that the plaintiff would bring another action.

WESTMINSTER POLICE COURT.

JULY 28, 1856.

(Before Mr. PAYNTER.)

THE DISTRICT BOARD FOR ST. JOHN'S AND ST. MARGARET'S, WESTMINSTER, *v.* THE CHARTERED GAS COMPANY.

JUDGMENT.

Mr. PAYNTER: This was a summons charging the defendants with having, on the 26th of June last, unlawfully broken up and opened the pavement and soil in a certain street in the parish of St. John, Westminster, for the purpose of laying down new mains of pipes, without the consent in writing of the District Board—that is, the Board of Works for the Westminster district. The offence complained of was alleged to be a breach of one of the provisions of the 109th section of the 18th and 19th Victoria, cap. 120—the Act for the better Local Management of the Metropolis. The facts proved or admitted were these:—That the company, created and incorporated in 1812 by the 50th Geo. III., c. 163, and 56th Geo. III., c. 87, had made a contract, dated the 8th of November, 1654, with "The Commissioners for Paving and Lighting the Parish of St. Margaret and St. John, Westminster," for lighting the streets east of Vauxhall Bridge Road for three years from 1854; that, by the statute last referred to, the District Board of Works had been substituted for, and was now represented by, the said commissioners; that the company, for the purpose of executing this and other contracts, had a large gasholder in the Horseferry Road, and have recently erected a new gasholder in Holywell street; that, for the purpose partly of connecting these gasholders, and partly for enlarging the mains already existing in their vicinity, the company, on the day mentioned in the summons, had broken and opened the pavement and soil in portions of the Horsferry Road, Earl Street, and Holywell Street, and dug a trench, wherein they had laid a new 12-inch main; that, previously to doing these works, the company on the 4th of April, 1856, had applied to the district board for permission to do such works for the purpose of laying down two mains; that such permission was refused; that subsequently, on the 21st of June, the company had given the board notice of their intention to do the like works for the purpose of laying down a gas main or pipe; and that such works, constituting the offence complained of, had been done accordingly. A plan of the locality was produced, and the contract put in, whereby the commissioners covenanted that they would at all times, whilst the company in execution of their contract should continue "amply and sufficiently to supply gas in the streets, &c., comprised in the contract," as occasion should require, permit the company, upon request made to the commissioners, subject to the provisions contained in any act or acts of Parliament in that behalf contained, or in any manner relating thereto, "to break up the pavement and soil of the said streets, &c., for the purpose of digging and sinking trenches, and laying down or repairing pipes for the supply of gas to light the said streets, &c." In answer to the summons, it was in the first place objected that no offence was proved, inasmuch as only one main of pipes was shown to have been laid down, whereas "mains of pipes" are the words used in the act describing the offence; and it was urged that the 4th section of the 18th and 14th Vic., c. 21, did not apply, because the word "main" in the singular, with reference to water companies, was used in describing another offence in the former part of the section. As the case is of some importance, and may be of frequent occurrence, and as this objection is alleged to have prevailed in deciding a similar case at another police court, it may be well to dispose of it. If it be a valid objection, then it would seem that any number of gas mains may be laid down without committing an offence, provided only one be laid at a time; and, on the other hand, if the reasoning were strictly and literally adhered to, the word "mains" in the first part of the clause would not be applicable to a case (or the whole of a case) where more than one main of water was laid down, as this would nullify both parts of the whole clause. Such a construction is altogether absurd, and must be rejected. If any reasonable construction can be found, such as to give force and meaning to the whole section, in which it is clear that neither of the words "main" or "mains" has been carelessly or inadvertently used—the singular being used in every case where water-works are referred to, and the plural where gas-works are the subject; the same distinction is observable in the corresponding clause of the General Paving Act (57 Geo. III., c. 29, s. 11), if it be read, *reddendo singula singulis*. The ground for such a distinction may perhaps be this:—Water, being always brought from a point *without* the metropolis, is at first, and for a considerable distance, conducted through a single main before it arrives at a point where its distribution commences; whereas gas-works are mostly or always *within* the metropolis, and their numerous mains begin at once to radiate from thence, as a centre, in all directions. In framing the clause, the singular or the plural was, therefore, used not inappropriately with reference to the respective subject matters. It would appear, too, from the letters of application for consent in this case, that more than one main of gas-pipes is occasionally laid in the same trench, which I apprehend is rarely, if ever, the case as regards water-works. I see nothing, therefore, to exclude the application of the remedial statute of the 13th and 14th Victoria, cap. 21, to the latter portion of this section, to which the summons relates; for that statute provides that the plural shall include the singular, "unless the contrary is expressly provided," which it certainly is not in this 109th section; and the argument drawn from the use of the singular, in the former part of the section, as *necessarily implying* such provision, fails, because the word "main" there is used with just reference to a different subject matter. The defendants also relied on a decision of the Lords Justices in the "Dover Gaslight Company *v.* the Mayor, Jurats, and Commonalty of Dover," reported in the 25th volume of "The Law Times," page 277. The circumstances of that case are, no doubt, very similar to those of the present case; but decisions of this nature, depending upon the construction of special acts and instruments, rarely furnish a satisfactory ground of decision, in other cases depending on different acts or instruments. The large number of such decisions, and their continual recurrence, show how little they tend to narrow the field of discussion on similar questions. The third ground of defence was the covenant for permission on request, contained in the contract with the company, it being contended that such covenant amounted in itself to a general permission for the purpose in question. The defence must, in my opinion, prevail. Such covenants must be liberally construed, because they form an essential part of the consideration which induces the company to lay out their capital, to plan and construct their works, and to form new works. The covenant also stipulates that the permission shall depend on the company continuing "amply and sufficiently to supply gas to the district covered by the contract," a condition of which the works in question must be presumed to promote the performance, and for the doing of which the permission cannot be withheld. The words, "subject to the provisions contained in any act or acts of Parliament in that behalf contained"—assuming them to apply to an act not then in existence—which were relied on by the complainant as qualifying and restricting the covenant, do not apply to anything contained in the 109th section of the Metropolis Management Act, which not only does not restrict, but recognises and sanctions, the power of district boards generally, even in the absence of any contract or covenant, to give their consent to such works. I may add, that it seems to me questionable whether the main laid down in this case was, strictly speaking, a "new main" of pipes; it seems to have been laid down in partial substitution for an old main; but my decision in no way depends on this. The arguments urged by the complainant, touching the future nuisance likely to arise from an increase of gas mains, is in some measure disposed of in the Dover case; but where could a line be drawn, limiting the effect of the covenant, and of the works and operations of the company? It must always have been foreseen that, as population and houses increased, such works must be increased, in order to furnish an ample and sufficient supply of gas. The gasholder itself must be a nuisance, but not the pipes which fill or empty it, and distribute its contents for the immediate use and convenience of the consumers. Such being the conclusion I have come to, the summons must be dismissed; but I am ready to put my decision in any shape that will best enable the parties to obtain the judgment of a superior court.

Miscellaneous News.

THE METROPOLITAN BOARD OF WORKS.

TUESDAY, JULY 22.

A Special Meeting of the Board was held this day in the Council Chamber, Guildhall—Mr. THWAITES in the chair—for the purpose of resuming the discussion on the engineer's plan for the drainage of the districts south of the Thames.

The minutes having been read and approved,

Mr. BRISTOW moved, "That the resolution of the board of the 26th of May last, as to the outfall of the drainage on the south side of the Thames, be rescinded." He said, the First Commissioner of Works having returned the plan sent up to him by the board, it became necessary to effect such an alteration in respect to the point of outfall as would be likely to prove acceptable to the Government. Before, however, the board could deal with the question, it was necessary to rescind the resolution which fixed Plumstead as the spot. He felt that, in the course pursued by Sir B. Hall, the board had not been very fairly dealt with. He was forcibly reminded of the old adage, "Save me from my friends." The Metropolitan Board was the creation of Sir B. Hall, who took the first plan submitted by them after long and patient deliberation, and returned it upon their hands in the coolest manner possible.

Mr. SNOW seconded the motion.

Mr. BURSLEM still felt that Plumstead was the proper place; it was also the favourite opinion of the late Frank Forster, and the Metropolitan Commissioners of Sewers would have adopted it if the plan of intercepting sewers had been carried out, as experiments proved that, discharged there, the sewerage would never find its way back to Greenwich Marshes.

After some remarks by Mr. Leslie on a point of order, the motion was agreed to.

Mr. BRISTOW then said, it appeared by the further report of the engineer that, although the outfall itself at Erith Marshes was out of the metropolitan district, the sewerage discharged there would flow back along two miles of that portion of the Thames which was within the proscribed limits. It occurred to him, consequently, that the same or similar objections would be made to the plan about to be considered, as to that which the Government

refused to sanction. He would ask the clerk of the board therefore, in the terms of his notice, whether the proposed outfall in Erith Marshes, inasmuch as the sewerage will flow into the Thames in or near the metropolis, was not open to the same objections as those stated in the First Commissioner's letter of the 2nd day of July, 1856, or some of them?

Mr. WOOLRYCH said, the objection taken to the plan submitted by the board to the First Commissioner was of a complex character. The introductory part of his letter referred to the oscillation of sewerage discharged at Plumstead between that point and the West India Docks, and then followed a legal objection founded on the phraseology of the act of Parliament, the terms of the act being that the Metropolitan Board of Works "shall make such sewers and works as they may think necessary for preventing all or any part of the sewerage within the metropolis from flowing or passing into the River Thames *in or near* the metropolis." The objection, as stated by the First Commissioner, was, that the scheme submitted for his approval "actually provided that the sewerage should flow into the Thames within the metropolis." He (Mr. Woolrych) was of opinion that the same objection would not apply to the amended outfall; nor did he think (as far as the words, "*in* the metropolis," were taken) there was any cogency in the argument, that perhaps in certain states of the tide the sewerage would be carried up within the metropolitan boundary, the point of discharge being fairly *out* of it. But then arose the objection founded on the other words, "near the metropolis;" and this involved a question of fact which would have to be determined, like every other question of fact, by examination of evidence and consideration of circumstances. It was impossible that anything like a fixed definition of the word "near" should be given. It was obviously a term of relative import. To say that a person lived near Manchester, might mean that he lived three or four miles off; but to say that a person lived near Manchester Square, would mean only a few yards off. If reference were made to Johnson's Dictionary, it would be found that its definitions were rather conflicting—viz., "close by" and "no great distance from;" therefore it was impossible to define what the word really implied, without a due consideration of the circumstances of the case in relation to which it was used. What were the circumstances here? The statute under which the board were called to act was a remedial one, and its provisions were *pro bono publico*. It was intended to relieve the Thames of all pollution arising from the discharge of sewerage within the inhabited portions of its banks; and, by a well-known rule of construction, all such remedial statutes were to be construed in a large and liberal spirit, so as effectually to prevent the possibility of failure which might arise from too nice a consideration of technical points. Such being the case, he felt some difficulty in giving a strictly legal opinion upon the subject, believing that the board were bound to look at the object contemplated by the Legislature in a broad and comprehensive manner, and to be guided by the facts before them. At the same time he would take upon himself to say, that he thought it would not be an untenable ground to take, seeing it was the evident intention of the Legislature to rescue the Thames from feculent pollution, that it was not a sufficient compliance with the act to carry the sewerage a short distance only below the metropolitan boundary. It was not to be what was commonly called "a close shave," but they were required to carry this refuse a good distance from the metropolis, so as effectually and thoroughly to get rid of it; and he thought he was not assuming too much when he said, that a judicious examination of the evidence of the intention of the act, and of all the other circumstances of the case, would bring them to the conclusion that it was incumbent on them to take it to such a distance as that it would not return into the metropolitan boundary.

Mr. BAZALGETTE read the following letter received from Captain Burstal, with his reply thereto, and the same were ordered to be printed.

Oban, N.B., July 13, 1856.

Dear Sir,—In great hurry I write to correct some mistakes you have made about my observations on June 18, in 25th line, page 4. The time is by tide tables 1 h. 52 m. P.M.; the time you name, 1 h. 30 m., is just after midnight, June 17. This is of serious importance in discussing this subject, and which I trust you will set aright.

The float, it is true, was in the water 2 h. 51 m. during the latter part of the flood-stream; but for the last 35 m. of that time it was between Bow Creek and West India Docks, the stream being very slack.

It was high water by the East India Dock flag at 1 h. 39 m. P.M.; allowing 15 m. earlier than London, makes the time of high water at London 1 h. 54 m. instead of 1 h. 52 m., as shown in the tide table, which will prove that the tides were not out of their course on that day.

In page 5, you remark that my observations show that the stream runs out faster during the first two hours of the ebb than the last two hours of the flood. *I* take the time of high water by the shore, which is the *proper* time of high water, as shown by tide tables. *You* take the time of high water as shown by the stream, which cannot be correct; and, if such time be taken (an average being made for the prolongation of time of high water at one place to high water at another, and the average duration of the flood streams after high water by the shore), would make the proper time of starting off Barking about 1 h. 25 m. before high water there to compensate for the circumstances alluded to.

I believe I am right in being under the conviction that the time of high water, as registered in Admiralty tide tables, was to be considered as the zero point from which the time of all the starting of sewerage was to be calculated, *not* the time the stream might slacken in the river.—Believe me, dear sir, yours very faithfully,

J. W. Bazalgette, Esq. E. BURSTAL.

Engineer's Department, No. 1, *Greek Street, Soho, July* 19, 1856.

Dear Sir,—I have received your letter, of the 13th inst., and see that I have taken the tide before your experiment on the 18th of June. I will correct this mistake at the next meeting of the board; but, if it at all effects the question, the correction is in favour of my views. I take the actual condition of the stream as affecting, and therefore regulating, my propositions; and, whilst I do not for a moment question or doubt the accuracy of your observations, I say that your impression, "that the time of high water, as registered in the Admiralty tide tables, was to be considered as the zero point from which the time of all the starting of sewerage was to be calculated," is entirely at variance with any proposition or intention of mine. As I understood it, your object was simply to verify the accuracy of previous experiments on the ebb and flow of the tide, and not to base any theory upon those experiments; and therefore we did not discuss the proposed method of discharging the sewerage.—Believe me, dear sir, yours very faithfully, (Signed) J. W. BAZALGETTE.

Capt. Burstal, R.N., &c. &c.

Mr. BAZALGETTE said, by the plan proposed in his further report, the sewerage would be discharged into the Thames at high water, and for two hours afterwards. He found by calculation that, *assuming the sewerage were like a float*, the portion discharged in Halfway Reach at the top of the tide would go out towards the sea, and ascend again as far as Erith Reach, about a mile and three-quarters below the outfall; that that which was discharged one hour afterwards would ascend with the next tide to within half a mile below the outfall; and the remainder, discharged at two hours after flood tide, would return to Barking Creek, or two and a quarter miles *above* the outfall. But it really was a question whether the sewerage which had gone down with the tide did return at all. It was quite clear that even if it did, it must be so copiously diluted with sea-water as to be perfectly innocuous; and there-it was for the board to consider whether, for all practical purposes, it could be considered as sewerage at all.

The board then proceeded to consider the report from the engineer on the outfalls of the main drainage and intercepting sewers below the boundary of the metropolitan area; the letter from the First Commissioner of her Majesty's Works, &c., on the scheme of intercepting drainage south of the Thames; and the report of Captain Burstal with reference to the tidal stream in that river; and to consider the following motion, proposed by Major LYON, and seconded by Mr. DIXON:—"That the outfall in Erith Marshes, as proposed by the engineer in his report of the 7th of July, be adopted; and that the discharge take place only at or after high water."

On the question being put,

Mr. DOULTON rose to propose an amendment. He said he believed that, by the adoption of that report, the board would place itself in a false position; and the practical result of it would be, the return of the plan as before, which would, he thought, be very undesirable. Some honourable members might think there was no disgrace attaching to the board on account of having their plan sent back by her Majesty's Commissioner of Works; but it appeared to him that there was—remembering that the reason of its rejection by the Government had no reference to matters of engineering, but was simply because it was adopted by the board in direct defiance of the act of Parliament, which they had been charged to carry out. The question was a very simple one, namely—Will the sewerage discharged at the point now proposed flow "in" or "near" the metropolitan boundary or not? If it could be shown that it would not, why then he was content with the resolution. If, on the other hand, it would, he asked was it wise to endeavour again to override the act of Parliament? They had not to go far for an answer to these questions; for it had just been admitted by the engineer, that the sewerage discharged two hours after high water would flow two miles and a quarter or two miles and a half higher up the river than the point of discharge. The experiments made by Captain Burstal, and those by the late Commissioners of Sewers, showed the same result; and that being the case, it would bring it within the metropolitan boundary: and it must not be forgotten that the proposed reservoir would take at least two hours to discharge its contents. He would therefore move, as an amendment, "That the engineer be directed to prepare a plan, with sections and estimates, for extending the main sewer to Long Reach; and that the sewerage be discharged there, only at or after high water." The only objection to this plan was its expense; but, while he admitted the force of this argument, he contended that the truest economy would be found to consist in doing the work in as thorough a manner as possible. They must do it at last, and they might as well do it once.

Mr. HOWS seconded the amendment. The board had been that day placed in the humiliating position of having to eat their own words, by the necessity cast upon them to rescind a former important resolution. To have any scheme which they proposed to Government rejected, did not tend to raise the character of the board; and, in order to prevent a repetition of this misfortune, he preferred the amendment to the resolution. It was quite clear to him that the board could not override the act of Parliament; and that, without the help of the Government, they had no power to get a new one, allowing the discharge to be effected at a point near the metropolis.

Mr. LESLIE asked the chairman whether he could put this amendment, as the board had, on a previous occasion, decided that they would not go to Long Reach?

The CHAIRMAN said the board had negatived a proposition for going to a particular spot in Long Reach, but there were twenty others they might select from; and, therefore, it was competent to entertain the amendment.

Mr. DENNIS said he should support the amendment, as being a step in the right direction. If the board adopted the plan of the engineer now before them, it would be open to as many objections as the former one, and they would have again to rescind what they had resolved upon. But, supposing it was not returned by the Government, the sum they would have to pay for land damage would be much greater than the cost of taking the sewer further down. The land at Erith was just now coming into cultivation, and was worth from £500 to £1000 per acre, and they would have some heavy demands upon them for compensation. A great deal had been said about Sir Benjamin Hall, but, for his part, he considered the right honourable baronet had only done his duty. Let the board leave off abusing the Government, and apply themselves to the preparation of a proper plan of intercepting sewerage, regardless of the expense. Sooner let the Government and the nation find fault with the cost of the work than with its imperfect execution. Why the smallest trunk railway would cost more per mile than this elaborate system of main sewerage!

Mr. WARE supported the amendment, though in doing so he did not act under any sense of humiliation because their former plan had been returned. He did not think that the conduct of the majority who carried that plan was open to censure; they acted in perfect good faith, and believed, in adopting it, that it was the best for the purpose, if it could be brought within the literal wording of the statute. The very circumstance that, in connection with that plan, Sir B. Hall tested the experiments previously made, was a sufficient justification of the course adopted by the board. The appointment of Captain Burstal for that purpose was a warrant to them to expect that, if the results of former experiments were confirmed, rather than put the ratepayers to a large additional expense, the Government would propose such a modification in the terms of the act as would enable the board to carry out the plan submitted by them. He would support the amendment, because he felt that they had now done enough to show that they had no desire to incur enormous additional expense, unless no other alternative were open to them, and the necessity for this increased taxation were forced upon them.

Mr. DIXON said, he should be very sorry to lay out an additional two millions of money on a mere supposition. He was certain that by the plan proposed not one particle of sewerage would find its way back to the point from which discharged. He exhibited some specimens of sewerage water which he had taken from the trunk sewer at Ratcliffe Cross, and from the centre of the river at the surface and eight feet below it. The deposits in each of these were very small, especially the latter; and he stated that by tasting it he could give the assurance to the board that, after it was allowed to stand and settle for a short time, a softer and smoother water it was impossible to have. If this was the case with water taken near the mouth of a large sewer, at a part of the river which was only 300 yards in width at high tide and 200 at low, could it be argued that any evil would arise from the discharge of sewerage at Plumstead Marsh, where the river was three-quarters of a mile in width, and contained upwards of 16,000 square feet of water? It was a great delusion to suppose so; and, if the people of Erith objected, and should succeed in getting the discharge carried further down, they would experience much greater injury from the reduction of the tidal wave.

Mr. SAVAGE supported the amendment, though he wished it had gone further, and proposed a discharge below Gravesend. The cost of carrying out this additional work, even if it approached £5,000,000, would only entail upon the ratepayers a maximum rate of 2½d. in the pound on the estimated rental of £12,000,000, and a minimum rate of 1d., supposing the charge were extended over forty years; and surely this was not to be an insuperable objection to the execution of so large and comprehensive a work.

Mr. HALL quite agreed with the motion for adopting the present report of the engineer, which he believed was a very reasonable and proper one. The strongest reasons that had been urged against it had been brought forward

very doubtfully, and the evils predicted were very problematical. It appeared that there was an entire want of agreement amongst the gentlemen who opposed the scheme of their engineer; for, while one wanted to send the sewerage into the Thames at Long Reach, another thought it should go to Sea Reach, and another would go to the sea-shore; but there were those who thought that it should not go to either of those places, but the sewerage should be deodorised where it was, instead of such an enormous expense being incurred in carrying it to such a distance from the metropolis. Those gentlemen who were not agreed upon any plan of their own were banded together for the purpose of defeating the very reasonable plan of their engineer, supported as it was by experiments which proved that the sewerage discharged as proposed would be mixed with so large a body of water, and carried down so rapidly with the tide, could never return to be offensive.

Mr. WRIGHT said, the shape in which the amendment was put before the board certainly justified the remarks of Mr. Hall, that those who proposed it wished to take the sewerage even still further down the river. If they committed themselves to this point, it might materially affect the question whether or not they might combine the northern and southern drainage, and carry both down together; for, if they came to this decision in reference to the southern, they would be compelled to a similar course in reference to the northern; and in proportion to the distance they carried these sewers would be the necessity for combining the two. The point suggested by the amendment was not far enough if a combination was intended, and too far if the sewers were to be separate. In looking at the map, he found that the superficial area of the river was the same at Long Reach as at Plumstead; the deodorising power would, therefore, be the same; and, whatever nuisance the outlet would be in the one place, it would be the same in the other. He would ask the engineer whether the sectional area of the river differed to any considerable extent at the point spoken of in the amendment from that in the motion?

Mr. BAZALGETTE: I should say that there is no appreciable difference.

Mr. WRIGHT: The depth, therefore, is not greater?

Mr. BAZALGETTE: I have not sufficient information before me to give a very accurate answer, but my impression is that it is about the same.

Mr. WRIGHT thought that this was a point which the board should well consider before they resolved to lay out an additional large sum of money. If the river, at the point proposed by Mr. Doulton, was twice the width and twice the depth, and they could prove that there they would secure a discharge into sixteen times the quantity of water, he could understand the object of the amendment; as it was, he concluded that it was attributable solely to a fear lest the scheme proposed by Mr. Bazalgette should be again rejected. He (Mr. Wright) had no fear that the present scheme would be rejected, although the First Commissioner had the power to do so, even without assigning any reason for doing it. He might, of his own accord, return any plan sent to him; he might, even if they went to Long Reach or Sea Reach, tell them that, if they went there, they would be spending too much of the ratepayers' money. As the right honourable baronet could not read his own act, the board need not wonder at his sending back their plans as he had done. In the letter which he had sent to them he said, "The scheme submitted for the approval of the First Commissioner actually provides that the sewerage shall flow into the Thames at a point within the metropolis." Such an objection could not be raised to the present scheme, the outfall of which was three miles below the metropolitan boundary. He then proceeded—"It consequently follows, that before any such scheme can be carried out, it will be necessary to call upon Parliament to repeal so much of the act of last session as provides for the purification of the River Thames within the metropolis;" but no such necessity could be urged in reference to the present scheme, and therefore the objection of the First Commissioner was fully met. He (Mr. Wright) had noticed, in the discussion on this subject, a tendency to confound the River Thames, after the sewerage was poured into it, with the sewerage itself. The act said that the sewerage should not pass into the Thames beyond a particular point, but it nowhere said that the river should not pass up beyond a certain spot when the sewerage was in it. The word "sewerage" could not certainly be applied to the Thames, when, to the extent of one-eighteenth part of its bulk, at a particular spot it was mixed with sewerage water; and the act never contemplated such a thing. He urged the board therefore to be careful how they adopted the amendment, believing, as he did, that the point of discharge now proposed by the engineer was one that the Government must approve. The sectional area of the river at the two spots indicated in the motion and the amendment being the same, there remained only the question of the relative value of property on the banks at each; and if, as had been stated, the land immediately above Erith was comparatively valueless, it behoved the board to fix their point of discharge there.

The CHAIRMAN said, as there had been some misapprehension as to what the First Commissioner's view were on this question, it was only right to state that which was within his (the chairman's) own knowledge. He might also be permitted to say that, though there was considerable fear excited in the public mind as to the point of discharge indicated by the motion of Major Lyon, he believed there was but little foundation for alarm; for, in his judgment, the sewerage poured into the river there would be far less injurious to the public health than was generally supposed. But it was quite clear that there was a strong impression in the public mind that the Government would never permit it. Now, what the First Commissioner really said to him in conversation was to this effect:—"I am exceedingly anxious to assist the Metropolitan Board to carry out what I know is a very difficult work. I am desirous that they should lay before me such a plan as I can send back to them approved; and they are mistaking me altogether if they think that I wish to interfere with or to thwart them in any way whatever; but under the act of Parliament I have a duty to perform, and I feel that it is imperative on me not to give my sanction to any plan that provides for the discharge of the sewerage within the metropolitan area, or sufficiently near to permit of its flowing back again within the boundary." That being so, whatever views the board might take, as practical men, as to the result of discharging the sewerage in Erith Marshes, it was perfectly idle for them to suppose that they could, singly and alone, carry it into effect, unless they could satisfy the Government that it was in strict and literal compliance with the requirements of the act. He regretted very much that their former plan had been sent back; and he should regret it still more if a second were returned. He did not share the feeling of some honourable members that the board had been disgraced by what had transpired; but he certainly did think that a second rejection would, to say the least, be unfortunate.

Mr. LESLIE wanted to know what, if this plan were adopted, the board would do with reference to the northern outfall. Here they were discussing, on the 22nd of July, whether, by carrying the southern drainage two miles further than the original point of discharge, it could by possibility return within the metropolitan area, when they had already determined that the sewerage of the northern side should be discharged at Barking. Was it not better for them to face all their difficulties at once, instead of dealing with them piecemeal? His advice was, that they should make a clean slate, and begin again, whereby, as he could show, they might save a million of money. He was perfectly satisfied that, if the board would let him go into his plan, he could show them how the northern and southern drainage could be carried out together. The argument on the other side was, that the further they went down the river, the more expense they would incur; but to this he said "No; the expense will be less, inasmuch as you will do the work efficiently, and in the manner prescribed by the act." No work to be undertaken by the board under their act must be a nuisance, or injurious to the public health; and they could neither borrow the money nor tax the ratepayers to raise it, unless they complied with this express stipulation. But what had they already determined upon? Why, that on the north side of the river they would have a cesspool 30 acres in extent! It was impossible that they could ever carry it out. It was not Mr. Bazalgette only who had made that proposition; every gentleman, from Captain Vetch downwards, had made a similar proposition; and why? Simply because the law compelled them to divide the metropolis into two parts—a northern and a southern side; but the Metropolis Local Management Act did not compel this board to do so. They could treat the metropolitan sewerage as a whole, and tax the ratepayers as a whole, for one common benefit. Honourable members had been finding fault with Sir Benjamin Hall, but what had he done? He had evidently read the act of Parliament, and done his duty, and the board had not. Now he (Mr. Leslie) was prepared, if the board would listen to him, to propound a scheme which should save at least a million of money, do the work more effectually, and be within the act of Parliament. Were the board detetmined to waste their time in sitting there until Christmas discussing first the northern, then the southern, drainage, afterwards to find that they could carry out neither?

The CHAIRMAN said that when the present amendment was disposed of, it was competent for Mr. Leslie to move that the board should take the northern and southern drainage into consideration at one and the same time, and as a whole.

Mr. LESLIE said he would do so, but that, as the mover of an amendment, he would have no right of reply to any fancied objections that might be raised to the plan he wished to propose. At present he would content himself by supporting the amendment, which certainly came nearer than any previous proposition to what, in his judgment, the board ought to do.

Mr. H. L. TAYLOR said there could be no doubt whatever that the question before them was one of very grave importance, and that, in the discharge of their public duty, they ought to satisfy their own minds that the proposition they agreed to was the best for securing the objects contemplated by the Legislature. It was not because there was an official connected with the Government, who had a veto upon their proceedings, that they ought to forego the decisions of their own consciences and judgment. They were bound to look at the question in all its bearings, and to deal with it according to the dictates of their calmest and most mature convictions. The question before them was the drainage of the south side of the metropolis; and on a former occasion a considerable majority of the board decided that the outfall should be at a particular spot on the banks of the river. They were aware at the time that, according to the strictest interpretation of the act of Parliament, that point was within the metropolis; but believing, as they were warranted in doing from the report of their engineer, that it presented less engineering difficulties, and that every purpose contemplated by the Legislature would be abundantly answered, they felt justified in adopting his recommendation, and sending up a plan in conformity with it to the First Commissioner. In the discharge of his duty, that government officer had thought fit to disapprove of the plan; and he (Mr. Taylor) was not disposed to throw the least blame upon Sir Benjamin Hall for taking that course, but rather to commend him for having done his duty fearlessly and honestly. He would not say a word about the mode in which it was done, feeling assured that they all had their little peculiarities, and that each might advantageously set about mending his manners. The board had now the plan before them again, and he would at once say that he did not feel the slightest compunction for the vote he gave on the previous occasion; for, looking at all considerations—not the most insignificant of which was the question of expense—he believed the board then did its duty. Certainly, if they could effect so great an improvement, and do all that was necessary to satisfy the requirements of the act of Parliament, and at the same time save some hundreds of thousands of pounds, they were bound to do it; but, if the Government then stepped in and required them to do more, it was their duty again to go into the subject, with a view to determine the next best course that was open to them. The board were not about to make this a party question; it was a matter that ought to be divested of all party spirit; and he believed that if, before they knew each other personally, their reputed antecedents had excited some feelings of that class, those feelings had now subsided, and, waiving all minor considerations, they were prepared to look at this important subject in a broad and comprehensive point of view, for the general good of the metropolitan community. The act of Parliament under which the board was constituted was one of the most voluminous upon the statute-book, and went very minutely into details of quite a novel character and bearing. Now, could it be supposed that such an act would at the outset be likely to be perfect, and that all its provisions could be carried into practice according to its strict letter, without any modification or amendment? He thought not; and that the board ought rather to look at the evident intention and meaning of the Legislature than at the strict literal interpretation of the text of the act. The clause that had been quoted (the 135th) required the board to construct works for preventing the sewerage from flowing into the Thames in or near the metropolis. And then came the question, how far from the metropolis should they remove it to prevent its flowing back into the area? If these two points could be secured, there was no fear of the Government returning their plans again. He was convinced that in this matter the Government did not wish to dictate to the board, if, having a due regard to the interests of the ratepayers, they adopted a plan which could be carried into effect without infringing the act of Parliament. With the views he held he could not support the amendment, nor could he agree to the motion without a slight verbal alteration. If the gallant major would consent to alter the words at the end of his proposition to, "and that the discharge take place only at, or *within one hour after*, high water," they would secure that which they all felt they were bound to secure—the non-return of the sewerage within the metropolitan boundary. As the motion now stood, the discharge might take place at any time after high water until the tide had gone out altogether, and many of the present mischiefs, as far as that locality was concerned, be continued; but, with the proviso he suggested, he was assured by the engineer that the sewerage could never return to the point of discharge. In conclusion, he would say that he altogether dissented from a part of the opening speech of Mr. Doulton, because he felt that he had taken an erroneous view of the whole subject. When that honourable member stated that the question was not whether the sewerage was damaging to the health of the metropolis, but whether the board were complying with the provisions of the act of Parliament, he (Mr. Taylor) could not help feeling that the proposition was most absurd. The duty and great object of the board were to do everything they

could for the health of the metropolis, and to do it at the least possible expense to the ratepayers.

Mr. WILKINSON said the last speaker should recollect that the general feeling of the public was in favour of the view taken by the First Commissioner, who objected to the plan submitted by the board as one not authorised by the act of Parliament. So long as the act of Parliament was in force, and expressed the wishes of the public represented at that board, surely they were bound by the terms of that act; and, with this conviction, he felt that it would be worse than folly to send up another plan to the Government similar to the last, as it could have but one issue—that of its being returned upon their hands. It was not, perhaps, for the board to consider whether or not the rejection of another plan would involve them in disgrace, but what would be the amount of delay and inconvenience it would involve. Under these circumstances, the board would be doing right in accepting the amendment, which would certainly clear them of the metropolitan boundary; whereas the clerk had told them that the outfall proposed in the engineer's present report, though beyond the metropolis, was still likely to be opposed, as being "near" the metropolis. If the board were discussing the question untrammelled by an act of Parliament, he was not prepared to say but that he might vote for the discharge at Plumstead, because the sewerage would be so largely diluted with water at that spot, that, practically, it would become perfectly innocuous. As, however, they were bound to comply with the act, he thought it was wise to refer the matter to Mr. Bazalgette. It might so happen that the report brought up by the engineer would show that it was not possible to carry the sewerage down to Long Reach; and if so, the board might safely revert to his present scheme, and send it up to the Government, assured that, after a due consideration of the facts, it would be accepted; and, if necessary, an alteration effected in the act to enable them to carry it out. He might be allowed to say that, in his opinion, a project of so gigantic and important a character as this ought to be taken up rather as a national question than as affecting the metropolis alone, and that the board ought seriously to consider whether they should impose the whole burden of its execution on the ratepayers of London alone, or apply to Government for help in the matter.

Mr. CARPMAEL said he held it as a settled principle, not only in engineering, but in every affair of life, that to do more than was necessary was an absolute mischief, and could not be considered prudent or great, though it might do all that was contemplated and desired. He believed it was the duty of the board to adopt the best scheme for ridding the metropolis of the sewerage, and to do it with the least possible injury to those who resided external to the metropolis; but beyond this they were neither bound, nor was it wise, to go. The engineer in his report had shown them that every step they took the sewerage beyond the point he had indicated at first, placed them at a greater disadvantage; and the calculations which he had made showed that, next to Plumstead, the place now selected in Erith Marshes was the best. It appeared that the distance from Woolwich to Erith was six miles, and it was mid-way between these two towns that he now proposed his outlet. The manifest advantage therefore was, that, while this outlet would be equidistant three miles from any inhabited spot, it would be constructed on waste and worthless land. But go beyond Erith, and what would be their position? Two miles further was the town of Purfleet, which was of as much importance as Erith; at a further distance of three miles was Greenhithe; two miles further, Grays Thurroch; a mile and a half further, Northfleet; and another mile and a half, Gravesend. So that, once quitting Erith Marshes, there was no locality on the banks of the river this side of Gravesend where the outfall could be constructed so remote from the dwellings of men. He defied any honourable member to point out a place so eligible, where the land was so unimportant, and so well adapted for the purposes contemplated as the one now before them by the motion of Major Lyon.

Mr. D'IFFANGER said he did not believe any harm could arise from the adoption of the motion; but, as he was quite sure the Government would never accede, it was idle for the board to entertain it.

Mr. BIDGOOD said, the remarks of the last speaker had quite decided his vote. A due regard to consistency would never allow him to be swayed by the consideration of whether Sir B. Hall would approve or not, when his judgment and his conscience pointed out the proper step to take.

The CHAIRMAN begged the honourable member not to judge of Sir. Benjamin Hall by what his friend said of him.

Mr. BIDGOOD, in continuation, said he believed the board had been constituted, amongst other things, and perhaps chiefly, for the purpose of cleansing the metropolis, taken as a great city, and not as defined by some distant geographical boundary; and that, if they succeeded in adopting a plan which effectually did this, they ought not to be hampered with any little technicalities arising out of the construction of the act. Believing, as he did, that the plan now before them would in effect do all that was required of them, he should vote for the motion.

Deputy HARRISON was delighted to learn that all party spirit and feeling was banished from the board, and that the only desire was to spend as little money as possible, consistent with the due execution of the works entrusted to them. For this reason he should vote against the amendment. He thought the honourable member for Marylebone was assuming too much when he said that their plans were sure to be rejected. He did not know on what authority such a statement was made; but he differed from the honourable member as to the result of the government inspection of them. With the slight alteration suggested by his friend Mr. Taylor, he felt that the most literal compliance with the act of Parliament would be ensured, and that they might take up their plan to the Chief Commissioner with every confidence of obtaining his sanction. At the present moment, when the district boards were taking credit to themselves for the economy of their arrangements, now was it likely that a proposition for spending £170,000 for additional works, and £8000 a year for pumping, beyond what was absolutely needed, would be received. With a feeling of consideration for the ratepayers of the metropolis, hundreds of whom he had seen summoned for nonpayment of their rates, and feeling confident that the smaller proposed outlay would do the work most efficiently, he gave his most cordial assent to the motion before the board.

Mr. BRISTOW had not been convinced, by anything he had heard, that the sewerage discharged at Erith Marsh would not return within the metropolitan area. He did not believe that the engineer's present plan would be accepted by the Government; and, as the board were dependent upon them for their approval, and would have to go to them for money to carry it out—and as, in addition, Sir B. Hall had intimated that he would not consent to an alteration in the act of Parliament—it appeared to him certain that the board had better adopt the amendment at once.

Mr. SEELEY, although usually in favour of a liberal expenditure when great works were in contemplation, could not help, on this occasion, feeling surprised at the spending ideas of some gentlemen on this matter who were usually on the side of economy; and he could not agree to lay out a quarter of a million of money for this work more than was necessary. The excess of the sum beyond what was required would furnish a park for Finsbury, and secure Hampstead Heath for the benefit of the public. He was satisfied that the discharge at Erith Marshes would be quite sufficient, and he was not content to spend one farthing for going beyond it. Any one who would take the trouble to look at the map would see that, if the amendment were adopted, it was only the first step in a march to Gravesend, and that the gentlemen who intended to vote for this proposition fully meant to go the greater distance. Well, then, let the fact be broadly stated, that by this plan the estimates would be raised from £2,500,000 to upwards of £5,000,000; and that when the board had succeeded in providing this large sum, they would have nothing left for public parks and street improvements.

Mr. NICHOLAY said the reason he should vote for the amendment was—not that he was dissatisfied with Erith Marshes, for he believed the outfall there would be sufficient—but he felt that the proposal for having it there would be returned, and that fact would "oscillate" very much to their detriment. Why not go to the Government, and ask them to take the responsibility off the shoulders of the board, and allow them to put the sewerage into the Thames nearer London?

After a few observations from Mr. DAVIS, the question was put, when there appeared—

For the amendment	13
Against it	14
Majority	— 1

A division having been demanded, the numbers were again taken, when they were found to be equal (14 on each side).

The CHAIRMAN then said: For the reasons that I have given, I must vote in favour of the amendment.

Mr. WRIGHT said: The chairman having assigned his reasons for thus recording his vote, I move that the words of his communication with her Majesty's Government be taken down.

The CHAIRMAN: My reasons for voting for the amendment are, that I believe the sewerage discharged at the point proposed by the resolution will return within the metropolitan area, and that consequently our plans, when sent up to the Government, will not be sanctioned.

On the amendment being put as an original resolution,

Mr. WRIGHT moved, "That the engineer be instructed to report on the desirability of carrying the entire sewerage of the metropolis, by means of one large tunnel, to Sea Reach." The object he had in view was to afford Mr. Leslie an opportunity for laying before the board his ideas on this subject. The honourable member had a strong opinion that to carry the sewerage down to Sea Reach would be the better plan, and that both sides of the metropolis should be treated as one. His (Mr. Wright's) own impression was, that before the proposal in the motion were agreed to, the board should require further information from their engineer; for, without adequate knowledge, he could never consent to put the sewerage into the river between Erith and Gravesend—the principal resort for pleasure of any part of the banks of the Thames. So long as the great intercepting drainage plan was in the hands of the engineer, he (Mr. Wright) held himself free from expressing any opinion; but, now that the board had taken it out of his hands, he felt bound to say that his conviction always had been, that the proper way to sewer London was to connect the north and south sides together, and pass the sewerage, by means of one large canal, down to some convenient spot for its discharge. That was his independent opinion as an engineer, but hitherto he had not felt at liberty to express it.

Mr. WILKINSON seconded the amendment.

Mr. LESLIE said he believed that the proper course for the board to adopt was to instruct their engineer to bring up a report in conformity with settled principles adopted by them; and, if they would now consent to accept the statement he was about to make, and give it as an instruction to Mr. Bazalgette, they would soon set themselves right. Hitherto the board had not acted on this policy, and the engineer had been compelled to follow those who had preceded him, which led him and them into a manifest error, because the act of Parliament had been entirely altered. In fact, the Metropolis Local Management Act had introduced an entirely new order of things, in relation to the local government of the metropolis, as regarded its sewerage and drainage—it having deputed to the representative vestries and district boards the management of the local sewerage, and created this board to govern the other authorities, to control the main drainage, and to make intercepting sewers for the prevention of all or any part of the sewerage from passing into the Thames in or near the metropolis. The act defined the limits and area of the metropolis, making no division of northern or southern; so that, for the first time in legislative history, both sides of the river formed one metropolis, as far as the sewerage and drainage were concerned. Of the important power thus bestowed upon them—the want of which had compelled the authors of all the schemes, from Captain Vetch and Mr. Frank Forster downwards, to adhere to the two-fold division of the metropolis, there having been no legal authority to tax the inhabitants of both sides of the Thames for one common benefit—the Metropolitan Board of Works must now avail themselves. On the basis of the division referred to, all existing sewers had been made; and they were of the most unsatisfactory character, costly in their maintenance, while at the same time insufferable nuisances, and most dangerous to the public health in their use. That board, then, as representing the metropolis, was called upon to put an end to such a state of things. The four following causes would themselves explain the effects they had produced, and point out what was to be avoided:—1. The low-water line of the Thames had been, and still was, the limit of the sewer discharge of the metropolis. 2. The levels of the lands on either side of the Thames were such, that the outlets of the sewers were tide-locked by gates and valves during long portions of the ebb and flow of every tide, probably as much as eight hours in every twelve. 3. If violent storms of rain descended during the periods when these outlets were so closed by the state of the tide, the sewers became overcharged, inundations occurred, vast amounts of property were destroyed, and many habitations made dangerous to their occupants; these calamities might also arise from accidents or negligence at the gates of the outlet. 4. The ponding back of the sewerage by these tide-closed outlets occasioned deposits in the sewers, very expensive to remove, and disgusting in the removal; destructive gases were generated, and their poisonous exhalations ascended through the gully-holes into the streets, which again had, at great cost, to be maintained. These elongated cesspools had cost millions of money, occasioned the loss of thousands of lives, and even now were dangerous nuisances to the public health, and most costly to the ratepayers to maintain. Fortunately, that board could not construct any such work; those which they had authority to tax the ratepayers for must neither be nuisances nor injurious to health—a most wise provision of Sir B. Hall's Act controlling their expenditure. The population of the metropolis had been, in 1851, rather more than two millions and a quarter; and it was wisely proposed, in the works they were about to construct, that arrangement should be made for another million and a quarter, thereby making a prospective population of 3,500,000 persons. It was, then, their duty to provide for the discharge of the excreta of this immense mass of human beings in such a manner that, neither at its commencement, in its progress, nor at its termi-

nation, should it be a nuisance or injurious to health. From physiological calculation, he (Mr. Leslie) had arrived at the following results:—That there would be in each twenty-four hours—solid discharge, 6 ounces; fluid ditto, 40 ounces; water (according to the expected supply), 5 cubic feet, or 4985·60 ounces; giving a total of 5031·60 ounces. Multiplying this individual quantity by the anticipated increased population, the result was 17,661,485 cubic feet in each twenty-four hours; and dividing this by 1440, the minutes in twenty-four hours, the result gave, as each minute's discharge, 12,265 cubic feet—a quantity which one Cornish pumping-engine would consider mere child's play. He (Mr. Leslie) had now to show the figure, diameter, area, and inclination of the channel adequate, in his judgment, to convey this sewerage to its discharge, which, he considered, should be at the bottom of the water, on the bed of the river, with a very large vertical weight of water over such discharge, so that it should not at that point, nor in its course to that point, be a nuisance or injurious to health. He believed the figure must be a circle, of 10 feet diameter, which gave an area of 78·54 cubic feet; and that the inclination should be 2 feet per mile. Two important questions arose at this stage of these propositions:—1st. What would such a sewer discharge? To this he answered, When only four-fifths full—that was, with 8 feet of water—it would discharge about 12,900 cubic feet per minute; the weight, volume, and velocity thus effecting a discharge in excess of the calculated quantity, even upon the exaggerated estimate which had been purposely framed. The second question was, What would be the cost of such a sewer? The various estimates which he (Mr. Leslie) had obtained, including side-entrances, &c. &c., ranged between £15,000 and £20,000 per mile. Taking into consideration the highest of these estimates, and multiplying it by the longest calculated length—say 40 miles—they had a sum total of £800,000; for which would be obtained an artificial channel from Putney, far down in Sea Reach, taking, in its progress seaward, the whole metropolitan sewerage, together with all that of Erith, Dartford, Greenhithe, Northfleet, and Gravesend. The difficulties of the southern side sank insignificance, in an engineering point of view, when compared with the contemplated works on the northern; and, again, it must be borne in mind the great facilities contractors would have by barging the materials, instead of having to incur the cost of land-carriage for the same. Now, he (Mr. Leslie) proposed to save the metropolitan ratepayers the whole of this enormous outlay, simply because the Metropolis Local Management Act informed him that it was only one metropolis, and not, as every previous calculation had made it, two. In doing so he lopped off the following items, viz.:

Proposed northern estimated expenditure east of the River Lee . .	£425,800
Sewerage works	90,000
Engine-houses, engines, and pumps	112,000
Cost of conveying sewerage from western district to Barking . .	258,110
Capitalising the annual expenditure on three pumping stations . .	
	£885,910

Thus, then, he found from works which, as he read the act, that board never could make, more than sufficient money to carry out the whole of the new line of sewer, forty miles in length, from the north line alone. From his datum line at the bottom of the water on the bed of the Thames at Putney to Sheerness, in the river's circuitous line, was about 50 miles, and the fall in its bed about 33 feet. In the shortened straight line this gave a natural fall of about 10 inches per mile, to which would have to be added 14 inches per mile, to make up a uniform fall or inclination of two feet. There would then be to raise at the terminus the sewerage about 50 feet, equal to 1200-horse power. He (Mr. Leslie) had repeatedly referred to the effects of the contemplated works of that board, and of the abstraction of large quantities of sewerage water upon the navigation of the river; and the important question of finding a compensation for this loss of water would necessarily engage their earnest attention. This must be sought for by separating the storm and surface waters, and the waters for public purposes, fountains, watering the streets, &c., which every vestry, every district board, and that board also, under the 150th section, might procure; and in this great improvement was involved the destruction of the nuisance of gully gratings throughout the metropolis. Having shadowed out this plan, it remained to notice that an intercepting sewer in connection with the straight line of intercepting sewer, must pass as close to the river as possible, to take up every existing sewer outlet, &c., on the northern side, to pass the sewerage so collected across the Thames to the main intercepting channel. Probably two of these crossings of the river would be found sufficient. On the southern side, the main intercepting sewer would take all from the southward as it passed in its straight course, and a small intercepting sewer would have to traverse the bank to catch all the outlets into the river, and join the main line again. One great advantage would be the comparatively small interruption of business these main interceptions would occasion. There would be no reversals of existing sewers. Sluggish flat lines, such as those in Belgravia, could be deepened by under-pinning, so as to give a good fall, and a self-cleansing action to existing nuisances. Purposely omitting any observations on the proposed expenditure on high-level and middle-level sewers, which might ultimately be found unnecessary, he preferred to commence these great works at their foundation, and get a new River Thames for sewerage purposes down to the sea. He (Mr. Leslie) felt that he had conscientiously discharged his duty to the metropolitan ratepayers and his colleagues of that board in the outline of the plan he had proposed. He had left no nuisance arising from the existing sewerage untouched; and in the new works, he had proposed to remedy the evils thus noticed. No nuisance or injury to the public health could arise from the plan he contemplated; but, on the contrary, the whole sewerage of the metropolis would be in constant motion towards its outlet. And now, in conclusion, he would just take a passing glance at one or two of the more prominent difficulties connected with that plan. It might be asked, who ever heard of a sewer 40 miles in length? In answer to this Mr. Leslie referred to the Croton aqueduct, by which the inhabitants of New York had obtained for themselves a supply of pure water from a similar distance of about 40 miles, in such abundance that fire insurances had been lowered 25 per cent. in consequence. Many other cities in the United States also drew their water-supply from miles distant. Again, another question might arise—who ever heard of crossing a river to effect the discharge of sewerage? To this he replied, that the difficulties in question were not substantial ones. He referred to the Thames Tunnel as one, and to the foundations of the contemplated new bridges across the Thames as other ready means of sewerage communication; but, failing all these, he pointed to the improved water supplies. The engineers of the water companies had passed their supply-pipes under the bed of the river, and in the most successful manner. The board, too would bear in mind that every inch of the bed of the Thames through which these operations were to be carried on was in the metropolis, and formed parts of the parishes represented at that board. The advantages of the plans he proposed, to the inhabitants of Lambeth, Southwark, Rotherhithe, Deptford, Greenwich, Woolwich, and Plumstead, were incalculable, by the much-increased depth of the intercepting sewer; whilst, again, instead of meeting with hostile opponents at Erith, Dartford, Greenhithe, Northfleet, and Gravesend, they would be hailed as public benefactors as the works progressed. He hoped and trusted, then, that the board would at once get rid of all the difficulties by which they were surrounded, and, taking a sponge, make a clean slate of all the plans before them. Let them commence *de novo*, by adopting these observations as the board's instruction to their excellent engineer, Mr. Bazalgette, for him to detail the plan and frame the estimates, so that the board would, in a few days, with the information in the office, be ready to submit the plan to the Chief Commissioner of her Majesty's Works for his approval, and so no time might be lost in commencing the most important of the works the act required the board to complete by the 31st of December, 1860.

Mr. WRIGHT inquired whether Mr. Leslie had made any calculation as to the cost of constructing the entire new system of drainage for the surface waters which he proposed?

Mr. LESLIE: No, but I intend to do so.

Mr. WRIGHT: With that new system every water-spout would require to be connected?

Mr. LESLIE: They would.

Major Lyon and Mr. Hows spoke briefly against the amendment.

Mr. DOULTON then moved, and Mr. HAWKES seconded, the adjournment of the debate, which was carried by a majority of one.

The debate was accordingly adjourned till Tuesday, the 29th.

FRIDAY, JULY 25.

The ordinary weekly meeting of the board was held in the Council Chamber, Guildhall, this day—Mr. THWAITES in the chair.

The minutes of the last board were read and approved.

THE NEW BRIDGE, WESTMINSTER.

Mr. R. TAYLOR said he wished to ask a question of the chairman on a subject which very nearly affected the interests of his constituents. He would be glad to know whether any communication had been made to the board as to the intention of the First Commissioner of Works respecting the new bridge, Westminster. He (Mr. Taylor) had been informed that, during the parliamentary recess, the matter was to be shelved, and that it was intended ultimately to abandon the present site.

The CHAIRMAN: We have received no communication from the Government at all.

Mr. R. TAYLOR was told that the First Commissioner intended to abandon the present bridge and the site; and, as many persons had purchased of the Government property which did belong to the bridge estate, under the impression that, as the new bridge had been commenced in consequence of the recommendation of a committee of the House of Commons, they would be safe in investing their money in that way, great apprehensions were entertained respecting this new proposal. His constituents were anxious to submit a memorial to this board on the subject before the rising of Parliament.

The CHAIRMAN thought that the matter was entirely beyond the jurisdiction of the board; and that, as Parliament would be prorogued on the following Tuesday, there would be no time for action, even had the circumstances justified it.

IMPROVEMENTS AT THE WEST END.

The CLERK read the following letter from the First Commissioner of Works:—

Office of Works, &c., July 16, 1856.

Sir,—I am directed by the First Commissioner of Her Majesty's Works, &c., to call your attention to the act 13 and 14 Vic., cap. 103, intituled "The London Bridge Approaches Fund Act." By the 21st section of that act it is provided, "That after full payment and satisfaction of all and singular the principal moneys and interest by the said recited acts and this act authorised to be charged thereon, or raised or borrowed on the credit thereof, the residue or surplus of the said several duties, annual sums, fees and revenues constituting the said fund, called 'The London Bridge Approaches Fund,' shall, during the continuance thereof, be applied to the opening of an improved line of communication between Coventry Street and Covent Garden, according to a plan to be hereafter approved and sanctioned by Parliament. Provided, nevertheless, that nothing contained in this act, or in the charges to be made on the said fund, under the authority of this act, shall operate or inure to extend or continue the said duties on coal and wines, annual sums, fees, and revenues, or either of them, beyond the said 5th day of July, 1862."

The First Commissioner has every reason to believe that, after paying the existing liabilities, there will be a surplus sufficient to carry out the improvement contemplated, which must of course be proceeded with before any other can be undertaken, provided Parliament shall sanction the plans. This line of communication has long been desired, and the Duke of Bedford has expressed his readiness to advance a large sum towards its completion.

Should the Metropolitan Board of Works desire to undertake the works, the First Commissioner considers that it would be more properly in their hands; but if they would not undertake it, he will give the notices this autumn, and proceed by bill next session.

It will afford him much pleasure to lay before the surveyor of your board any plans that may be in this office.

I am, &c.,

(Signed) G. RUSSELL, Assistant Secretary.

The Secretary to the Metropolitan Board of Works.

On the motion of Mr. HALL, it was resolved that the clerk do write to the First Commissioner, informing him that the board have had the matter under consideration, and have referred it to a committee.

Mr. LESLIE thought the board should deal with the subject more comprehensively, and intimated that at the next meeting he would call the attention of the board to the desirability of combining in one or two acts of Parliament the following metropolitan improvements:—An entirely new line of street from the west end of Cheapside, having a viaduct across Farringdon Street, with a continuation through the proposed improvements in Carey Street, with a continuation from thence to the proposed improvements to which His Grace the Duke of Bedford had agreed to contribute £15,000; the whole length of such new street from St Martin's Lane to the west end of Cheapside would be about one mile and 1,722 feet=7,002 feet lineal.

The cash account presented showed a total general balance of £135,739. 12s. 4d.

The board then adjourned.

TUESDAY, JULY 29.

A Special Meeting of the Board was held in the Council Chamber, Guildhall, this day, further to consider report from the engineer on the outfalls of the main drainage and intercepting sewers below the boundary of the metropolitan area; the letter from the First Commissioner of her Majesty's Works, &c., on the scheme of intercepting drainage south of the Thames; and the report of Captain Burstal, with reference to the tidal stream in that river. Mr. THWAITES took the chair at twelve o'clock, and the minutes of the last meeting were read and approved.

After a brief conversation, the following motion and amendment, which were before the board at the last special meeting, were put to the vote, and the amendment declared to be negatived, viz:—Motion, proposed by Mr. Doulton, and seconded by Mr. Hows, "That the engineer be directed to prepare a plan, section, and estimate, for extending the main outfall sewer on the southern side, to a point in Long Reach below Erith, and so as to be discharged at and after high water only;"—the amendment thereon, proposed by Mr. Wright, and seconded by Mr. Wilkinson, "That the engineer be instructed to report on the desirability of carrying the entire sewerage of the metropolis, by means of one large tunnel, to Sea Reach."

A division being demanded, there appeared,

For the amendment	4
Against it	19
Majority	— 15

On the original question being again proposed—

Mr. CARPMAEL rose to propose another amendment. He said, he thought the board would feel, in reference to the letter of the First Commissioner of Works rejecting the plan previously sent up to him by the board, and which scheme had its outfall at Plumstead Marshes, that it would be unbecoming in them to defer to another power without discussing the subject with that power; and that it would be more seemly for the board to rescind so much of their former resolution as placed the outfall at Plumstead Marshes, and to arrive at such a resolution as would place the point of discharge at such a distance from the metropolis, that the sewerage, or the water with which the sewerage was mixed, should assuredly never come within the metropolitan area. It might be important for the board to consider whether the opposition to the plan arose from a conviction of its want of conformity to the act of Parliament, or from a pressure of the Woolwich officers and Lord Panmure. If this were so, ought the metropolis to be called upon to spend £300,000 or £400,000 for the south side, and the same for the north, in order to satisfy the objections arising from that quarter? He was, however, willing to go to any reasonable extent to comply with the act, and the requisitions of her Majesty's Office of Works. Under all the circumstances, he had arrived at the conclusion that the proper way would be for the board to come to a resolution adopting the report of the engineer of the 7th of July, which recommended an outfall between Woolwich and Erith, and to appoint a deputation of the board, giving to such deputation suitable instructions, by means of which they could place before the First Commissioner the reasons which induced the board to send up the original report, and now to adopt the one of the 7th of July. In the event of his amendment relative to the adoption of the engineer's further report being carried, he intended to propose a resolution to the effect, that a deputation be appointed to wait upon the First Commissioner, and that to this deputation should be given a series of instructions which he would not now trouble the board by reading, but simply move that they be printed and circulated, in order that they might be taken into consideration at the next meeting. Those instructions contained the reasons which had induced the board to send up the original report, notwithstanding that they were informed the point of outfall was in the metropolis, feeling satisfied, as a large majority of the members did, that in an engineering point of view it was the most efficient for the purpose; and entertaining, as they did, the reasonable hope that, to avoid a wasteful expenditure of public money, the First Commissioner would aid them in getting that clause in the act repealed which stood in the way of its being carried out. The instructions then went on to say that, in consequence of the letter of the First Commissioner, the board had taken the subject again into their consideration, and, after thoroughly investigating it, had come to this conclusion, that if they passed the sewerage into the Thames at high water, at the point now proposed by the engineer, in Erith Marshes, three miles from any town, it would be carried down to the sea so copiously diluted, even at the outfall, that it could not possibly be a nuisance or injurious to public health.

The CHAIRMAN said the amendment of the honourable member could not be put, as it was almost identical with the motion of Major Lyon, which had been rejected at the last special meeting.

Mr. LESLIE: Then we have been favoured with Mr. Carpmael's speech for nothing. We seem to be in a great state of confusion.

The CHAIRMAN: There is no confusion at all, Mr. Leslie, except that which exists in your own mind.

Mr. HAWKES said that he had always entertained the strongest objections to reservoirs, and would move, as an amendment, the omission of the words "so as to be discharged at or after high water only" from the resolution.

Mr. SEELEY seconded the amendment, for the purpose of expressing the great dread he felt lest the board should adopt the motion as at present worded. He was certain that the outfall at Long Reach would be a failure; that Plumstead was the best, and Erith Marsh the next best, spot; and that, if they went below that part of the river, they would have all the towns on the banks ranged against them—in fact, the alarm would be doubled every mile they proceeded. On the other hand, he felt that if they gave up Plumstead or Erith, below Gravesend they must go.

Mr. HOWS said he trusted Mr. Hawkes would withdraw his amendment. He had satisfied himself, by going down to Long Reach and conversing with men practically acquainted with that part of the river, that the board would do well to keep to that spot. As to the question of reservoirs, he objected to them, but he hoped any discussion as to their adoption would be raised on an original motion, and not by way of amendment.

Mr. DAVIS, although he would vote for the motion, was not at all satisfied that they had the best plan for southern drainage before them. He was of opinion that great danger might arise from taking the whole of the storm and surface water out of the Thames, and he thought that a great part of this could be put into the river without detriment to the public health.

Mr. HAWKES consented to withdraw his amendment.

Mr. HALL could not allow the question to stand as it was without entering his protest against it. He complained that no justice had been done by the public press to the part which he himself and other honourable members had taken. It was not correct to state that he and other members believed that, by allowing the sewerage to be discharged at Plumstead, any portion of it would re-enter the metropolitan area. Amidst much interruption, the honourable member, for the sake of obtaining a right to address the board, proceeded to move, as an amendment, "That the question be not now put;" and, in doing so, stated that in his opinion the motion, if carried, would lead to an expenditure on both sides of the river of half a million of money more than was necessary.

Mr. DAVIS wished to inform Mr. Hall that Woolwich, Deptford, and the adjoining localities were not to be poisoned to satisfy the City constituency.

Mr. Hall's amendment was not put, but, after some discussion on points of order,

Mr. DALTON moved, "That a deputation of this board do wait upon her Majesty's Commissioners of Works, to obtain their approval to the plan of the engineer presented on the 7th instant."

The CHAIRMAN ruled that this amendment was not admissible.

Mr. DIXON moved, as an amendment, "To inquire of the engineer if he can devise a plan by which the up-land and low-level sewerage may be run into elongated tunnels, to remain there eight hours, then to be started into the mid-stream of the river within two hours after high water; the precipitated silt to be drawn off into covered tanks to be deodorised, and taken away in tubular carts and waggons for agricultural purposes."

The CHAIRMAN ruled that this amendment was out of time.

The board then divided on the original question, when there appeared—

For the motion	18
Against	12
Majority	— 6

EMBANKMENT OF THE THAMES.

Mr. WRIGHT, pursuant to notice, moved, "That the low-level sewer, as delineated on the northern side of the metropolis, be adopted, subject to a variation from Hungerford to London Bridge, in case a Thames embankment be carried out within such period as will enable this board to comply with the requirements of the Metropolis Local Management Act." He thought it must be manifest to all that a sewer of such magnitude, carried out near the banks of the river between Westminster and London Bridges, must of necessity in its construction cause a large amount of damage to the valuable property adjacent to it. The experience of their predecessors in the case of the Victoria Street sewer might teach them how large an addition to the working estimate must be made for damage; and when they remembered that the sewer proposed to be carried under Fleet Street, the Strand, and other main thoroughfares, was, in its external diameter, from 15 to 20 feet, they could not doubt that the displacement of so large a body of earth as this would occasion would lead to serious results, which it was very desirable, if possible, to avoid. And not only so, but, apart from the question of expense, the inconvenience to traffic should be taken into consideration; and this would be greatly increased by the necessity there would be for openings in the road at every hundred feet or so, for the purpose of removing the earth that would be excavated. By executing the low-level sewer in conjunction with a scheme for Thames embankment, these difficulties would be overcome. Moreover, if this low-level sewer were undertaken separately, all the sewers between it and the river would have to be reversed—a work that would necessarily lead to a very large expense. When these circumstances were considered, in conjunction with the fact that the embankment of the Thames had, during several years, met with the approval of all parties in Parliament, and that the last committee on the subject decided that it was desirable the matter should not be proceeded with until the Metropolitan Board of Works had been established, he thought he had made out a sufficient case to prove that the board ought to pass some resolution on the subject, intimating to the public that they were open to consider plans for Thames embankment. He briefly reiterated his former statements as to the probable cost and saving, and the improved street accomodation, it would afford. According to his calculations, a sum of £250,000, or thereabouts, would be saved by constructing the sewer in conjunction with the embankment of the Thames; and, not to dwell upon the advantages of such a work, he would only allude to the manifest convenience that would result to the public from the construction of a new street from the west end to London Bridge. He merely desired at present to leave the question open, so as to induce parties to bring up their plans to the board.

Mr. DALTON seconded the motion. The subject of Thames embankment had been frequently before committees of the House of Commons, and reported favourably upon; and all the engineers who considered the subject had come to the conclusion that it was a work which ought to be done.

Mr. D'IFFANGER asked whether the adoption of the resolution involved the approval of the proposed outfall at Barking Creek?

Mr. WRIGHT: By no means.

Mr. D'IFFANGER would then support the resolution, which did not commit the board to take up the question themselves.

Mr. HOWS, although rather demurring to the adoption of the low-level sewer, would, under all the circumstances, record his vote in favour of the motion, which he wished had been more definite.

The CHAIRMAN said the board would remember that, on a former occasion, a legal question as to the powers given to them by the act of Parliament for the construction of such a work was raised, and Mr. Woolrych was instructed to look into the matter, and report his opinion to the board. He thought it would be well, before proceeding further, that they should hear Mr. Woolrych.

The CLERK said, having considered the subject referred to me in the resolution of the board of the 8th instant, I am of opinion that the embankment of the Thames belongs to that class of works described in the 144th section of the Metropolis Local Management Act, as one directed, amongst other objects, to the making of a way for facilitating passage and traffic between different parts of the metropolis; and, assuming that the work were one which could be accomplished within the limit as to expense, which would render the application to Parliament unnecessary, and that the requisite consent on the part of the public authorities and the owners of private property along the river could be obtained, I consider it a work which the board ought at once to proceed to execute, under the general power conferred by the enactment in question. But, inasmuch as practically it is well known that the cost of the works must greatly exceed the pecuniary limit defined by the section referred to, and the proposed operations must necessarily affect the rights of the Crown and the Corporation of London, and, at the same time, involve extensive interference with the wharf and other property along the river, it is clear that an application for further powers must be made to Parliament; and I conceive that such an application is contemplated and authorised by the act. Such application I consider indispensable, as the formation of the embankment does not fall within that class of works described in the 155th section—namely, works of sewerage and drainage—to which alone the power of obtaining land compulsorily applies; nor, in my opinion, is the case altered by the circumstance that the embankment and low-level sewer may be formed together.

Mr. LESLIE inquired of the chairman whether that opinion did not dispose of the whole question?

The CHAIRMAN thought it would have done, but for the special wording of the resolution.

Mr. WARE said the real question before the board was as to the construction of the low-level sewer, and had simply to do with an embankment in the event of such a work being undertaken before the term expired within which the sewer must be made. If it did not involve the question of outfall, he could see no objection to it.

Mr. DAVIS said the board would, if they adopted this resolution, be pledged to the engineer's plan for the low-level sewer; in fact, they would be doing that which all along they had said they would not do.

The CHAIRMAN reminded the last speaker that the board had already adopted the engineer's low-level sewer, except that part lying between Westminster and London Bridges; and this motion proposed to deal with that portion of the district in a certain way, if, before the work was undertaken, a certain other work were set about.

Mr. DAVIS thought it was dealing with a shadow to propose to do something if something else took place. He moved "That the question be not now put."

The amendment was not seconded.

Mr. HAWKES did not approve of the board depending upon any public company undertaking a certain work, before deciding which way they would act. He would rather that they undertook the whole themselves, as he was persuaded that this was the only mode of effectually improving the traffic accommodation of the metropolis, and they could have no finer opportunity of carrying it out than in conjunction with the formation of this important line of sewer. It was a work which sooner or later must be effected, and he

would much rather this board had the glory of it. He would move, therefore, as an amendment, "That proper measures be taken to carry out the low-level sewer in conjunction with the embankment of the Thames."

This amendment, too, was not seconded.

Mr. OTTOR hoped the board would pause, as he felt it would be utterly impossible to carry out the Thames embankment, and give the metropolis an efficient system of intercepting sewerage by 1860. The board had only three years before them, and the works they were called upon to execute in that time were quite harduous enough, without encumbering themselves with this gigantic project. At the same time, he agreed generally in the observations made respecting the importance of the work; but he believed, when undertaken, it would have to be on both sides of the river.

The question was then put to the vote and declared to be carried: a division being demanded, the numbers were—

For the motion	21
Against it	7
Majority	— 14

The CHAIRMAN: Having decided that point, what do the board intend to do with the engineer's report for the northern drainage?

Mr. CARPMAEL: I intend to move that it be carried up to the Chief Commissioner of her Majesty's Works and Public Buildings; and I shall also move a series of instructions to the deputation by whom it will be laid before him.

The CHAIRMAN: Do you propose that the plan shall be sent up with the same outfall?

Mr. CARPMAEL: Yes.

The CHAIRMAN: I think, then, as this proposition will most likely lead to a discussion, it will be necessary to give notice of your motion.

Mr. CARPMAEL then gave notice in the usual form.

The CHAIRMAN inquired of the engineer when he would be prepared with his report on the southern drainage, in accordance with the resolution the board had adopted that day.

Mr. BAZALGETTE: Probably in a week or ten days.

The CHAIRMAN: Then I will call a special meeting of the board as soon as the engineer is ready.

The board then adjourned.

FRIDAY, AUGUST 1.

The Ordinary Weekly Meeting of the Board was held at Guildhall this day—Mr. THWAITES in the chair.

The minutes of the last meeting were read and approved.

The CLERK presented a report on the state of collections, and the board proceeded to issue warrants against defaulters on district sewers' rates, and to allow certain deficiencies.

FINANCE.

Mr. DALTON brought up a report from the committee appointed to confer with vestries and district boards, recommending that the debts of the late Commissioners of the Foundling Estate, amounting to £19,336, be apportioned in the following manner:—St. Pancras, £12,578; St. Giles, £6747; Holborn district, £10: that the debts and liabilities of the late Commercial Road Trust, amounting to £6194, be thus apportioned:—St. George-in-the-East, £1153; Hamlet of Mile End Old Town, £2476; Limehouse, £2398; Poplar, £165: and that certain assets, consisting of the sum of £169. 17s. 4d., being the balance of an amount retained by the late Commissioners of the Foundling Estate, to meet the claim of the New River Company for watering the streets, be thus apportioned:—The parish of St. Pancras, £99; the district of St. Giles, £70; the Holborn district, 2s. 4d.

On the subject of the debts of the late Commercial Road Trust, a deputation consisting of the vestry-clerk of the hamlet of Mile End Old Town, and Mr. Newton, a vestryman, attended to present a memorial complaining of inequality in the apportionment of that district.

After considerable discussion, the whole of the committee's recommendations were acceded to.

Mr. DALTON then brought up a report from the finance committee, recommending, *inter alia*, that the sums specified in the statement submitted to the committee, amounting in the whole to £8951. 4s., be paid; that the sum of £5000 be removed from the deposit account and placed to the current account of the board; and also submitting statements containing particulars of the outstanding loans and mortgages of the board; of the financial condition of each parish and district in the metropolis; an estimate of the sums required to be raised by the board for the year ending Dec. 31 next; and a return showing the proportionate sums to be contributed by the several parishes, districts, and parts, under the Metropolis Local Management Act, in respect of amounts varying from £5000 to £100,000.

The two recommendations were agreed to; and, on the motion of Mr. DALTON, seconded by Mr. HALL, it was resolved that the statement of finances, &c., submitted by the committee, be received, printed, and circulated among the members of the board, preparatory to its being discussed.

The SUPERINTENDING ARCHITECT, in reference to a resolution adopted by the board a few weeks back, requiring him to consider what are the powers of the board to restrain the height of buildings in streets, now reported as follows:—"I am of opinion that there is no power given to the Metropolitan Board of Works, under either of the acts, to set any restrictions upon the heights to which buildings may be carried, so long as their walls are of a sufficient thickness for the proposed height, according to the schedule regulating the thicknesses of walls by their heights and lengths; neither do I find any powers limiting the projection of cornices of buildings, but, on the contrary, cornices and copings, if constructed of fire-proof materials, are excepted, in the 26th section of the Metropolitan Building Act, from other projections which require the consent of the Metropolitan Board of Works."

NEW STREET IN SOUTHWARK.

A letter was read from the First Commissioner of Works, requiring information as to whether the board intended to proceed with the Southwark improvement this year; and if so, that he might be favoured with copies of the plans, &c., so as to be able to judge whether they would at all affect the contemplated improvements in Parliament Street.

The CLERK was directed to acknowledge the letter, and inform the First Commissioner that the board had referred the matter to a committee, which would shortly report thereon.

Mr. LESLIE'S motion respecting the new street from the City to the West End was postponed till the next meeting.

The cash account presented showed a total general balance of £135,782. 17s. 6d.

The board then adjourned.

BOSTON.—An accident of a somewhat novel character happened recently to a gasholder 70 feet in diameter, which had been for some time in use at the Boston Gas-Works. The bottom ring had got out of a true circle, and it was proposed to remedy this defect by raising the gasholder above the surface of the water in the tank, and inserting some tie-rods; to carry out which intention the gasholder was filled with air, and, when it would rise no higher, long levers were inserted under it, and, by using the edge of the tank as a fulcrum, it was hoped it might be raised out of the water. The workmen employed neglected, however, to open the man-hole, and, as force was applied to the levers, the gasholder collapsed and fell over; but it is stated the damage is not so serious as might have been expected, and that it is capable of being repaired.

LIVERPOOL METER INSPECTORSHIPS.—It is said that 46 applications were made to the committee by persons offering themselves for these new offices, and that the numbers have been reduced to 7, from which the appointments will be made by the council at their September meeting.

DEATH OF SAMUEL CLEGG, JUN.—The daily papers announce the premature decease of this gifted gentleman on the 25th ult., at his residence, the Hill, Putney, at the early age of 43.

THE SEWER OUTLET AT SOUTHAMPTON.—Much amusement was caused in the Crown Court at the Winchester Assizes, by the clerk of the court announcing that the grand jury had found a bill "against the Mayor of Southampton, for a nuisance!" On inquiry, we ascertained it to be a true bill for a nuisance, preferred against the Local Board of Health, at the instance of the Itchen Bridge Company, consequent upon the outlet of the sewer adjacent to the company's premises. The witnesses in support of the indictment were Messrs. R. Coles, J. Wiblin, C. P. Keele, and W. Lankester. The Local Board will have to put in an answer to the indictment at the next sessions, unless in the meantime they abate the nuisance charged against them.

Price Current.

CASTINGS, per Ton.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow	Newcastle.	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	4 15 0	3 15 0	3 15 0	4 0 0	4 0 0
1¼ and 2 inches Socket Pipes . . .	8 0 0	7 5 0	7 10 0	7 15 0	7 10 0
2½ and 3 „ „ „ . . .	7 10 0	7 0 0	7 5 0	7 10 0	7 5 0
4 and 5 „ „ „ . . .	7 10 0	6 15 0	7 0 0	7 5 0	7 0 0
6 in. & upwards „ „ . . .	7 5 0	6 10 0	6 10 0	7 0 0	6 10 6
Retorts, 1st fusion, hot blast . . .	7 0 0	...	7 0 0	7 5 0	7 0 0
„ 2nd „ cold „ . . .	8 0 0	...	7 5 0	7 10 0	7 5 0
Tank Plates, ⅜ thick and above . .	7 10 0	6 15 0	7 0 0	7 5 0	7 0 0

COALS.

NEWCASTLE.	s.	d.		SCOTCH CANNEL.	per ton.
Unscreened.	7	0	per ton	Boghead, at Leith	28s. 0d.
Whitwell Primrose	7	6	„	Kirkness, best	23 0
Pelton and Medomsley . .	7	9	„	Capeldrae, 1st quality	20 0
Pelaw				„ 2nd „	12 6
Burnhope, Eighton Moor, New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	8	0	„	Lesmahago, at Glasgow	25 0
				„ „ Leith	27 6
				Arniston	22 0
				Wemyss	20 0
				Knightswood	18 0
Ramsay's Newcastle Cannel	14	0	„	Methill	13 0

SUNDRIES.

Best Newcastle fire-bricks, 60s. per 1000
„ „ „ clay, 12s. per ton.
Cliff's fire-bricks at Wortley, 57s. 6d. p. 1000
Tough cake copper, £107. 10s. per ton.
English pig lead, £25 per ton.
Welch bar iron, in London, £9 per ton.
Foreign spelter, £24 per ton.
English block tin, £129 per ton.
Banca „ „ £130 per ton.
Tarred rope yarn, 18s. per cwt.

WROUGHT-IRON TUBING, subject to 35 per cent. Discount.

	2 inches.	1½ inch.	1¼ inch.	1 inch.	¾ inch.	½ inch.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent welded tubes, from 2 to 12 feet, per foot	1 8	1 0	0 10	0 7	0 5	0 4½
„ „ „ 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting pieces, or long screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, springs, and elbows—wrought iron . .	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron cocks	17 6	9 6	7 6	4 6	3 3	2 6
„ with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing sockets, caps, plugs, and nipples .	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2 quart	15 0	14 0	13 6	13 0	12 0	

FREIGHTS, per Ton.

Coastwise—Newcastle.		*Foreign.*	
Chatham & Roches-	7s. 0d	Boulogne	8s. 0d
Cork . . . . . [ter	10 0	Barcelona	32 0
Dover	7 0	Bordeaux	19 0
Dublin	10 0	Cadiz	22 0
Exeter Quay . . .	9 0	Calais	8 6
Folkestone	6 9	Dieppe	10 0
Hastings	8 6	Genoa	33 6
London . . [mouth	6 9	Hamburg	10 9
Lowestoft & Yar-	4 9	Havre	10 6
Lynn	6 0	Leghorn	23 0
Portsmouth . . .	9 0	Lisbon	22 0
Plymouth	9 0	Rotterdam	9 0
Whitstable . . .	7 0	Stettin	14 6
Weymouth	8 6	Trieste & Venice . .	38 0

J. CLIFF'S
FIRE-BRICK WHARF,
No. 4, Great Northern Goods' Station, London.

WORTLEY { FIRE-BRICKS, CLAY RETORTS, LUMPS, AND GUARDS.

A Large and Assorted Stock always kept on hand at the above Wharf.

Orders for London and South of England to be addressed to Marcus B. Newton, Agent for the District, No. 14, South Street, Finsbury Square, London.

TAR CONTRACT.

THE Directors of the Western (CANNEL) GASLIGHT COMPANY (limited) are prepared to receive TENDERS for the TAR which may be produced at the Company's Works at Kensal Green (on the Grand Junction Canal), for one year, commencing October 5 next.

The Tenders to be at this Office by ten o'clock on Thursday, the 14th inst. Further Particulars may be obtained from S. Barber, Secretary.

28, Argyll Street, Regent Street, London, Aug. 1856.

TO MANUFACTURERS OF AMMONIACAL SALTS.

THE Nottingham Gas Company are desirous to receive TENDERS for the Purchase, for a term of years, of the Ammoniacal Liquor produced at their Three Works, situated at Nottingham, Radford, and Basford, amounting at the present time to about 600,000 gallons annually.

The Liquor is now being manufactured into Sulphate of Ammonia, on a plot of ground belonging to the Company, immediately adjacent to the Nottingham Gas-Works, which the Contractor may hold during the period of the Contract, together with so much of the existing Buildings and Apparatus as are the property of the Company, at a very moderate rental.

The Contractor will be required to keep the Company's Stores clear of Liquor, and must pay an annual rent proportioned to the number of thousands of tons of coal annually carbonized, beginning with a fixed rent for 20,000 tons.

The Contractor is to take possession on or before the 1st of October next, and Tenders for the liquor will be received by Wm. Hurst, Esq., Clerk to the Company, at the Gas-Office, Nottingham, not later than the 27th day of August next.

By order, T. Hawksley.
Engineer to the Company.

Nottingham Gas Office, July 17, 1856.

Note.—Each 1000 tons of coal are estimated by the company to produce about nine tons of sulphate of ammonia; but of this the contractor must inform himself before making his tender. The Company do not bind themselves to use any particular description of coal, or to accept the lowest or other tender.

MONOPOLY and Intimidation.

Livesey Fire-Clay Works, near Blackburn, July 18, 1856.

To the Editor of the *Blackburn Weekly Times*.

Sir,—From the enclosed letter you will perceive that, because we will not join the Association of Sanitary Tube Manufacturers, for the purpose of keeping up the prices of Stone-Ware Glazed Pipes, we are threatened with total extinction by a wealthy firm. We can assure you and the public that a more tyrannical monopoly does not exist than the aforesaid Association, and one which we trust the public will help us to combat; for, after all, this is a question that concerns the public more than ourselves, for we have no fear of not being enabled to meet even the ruinous prices threatened by Messrs. Doulton Brothers and Co., or any other firm in the trade, from the purely natural advantages which we possess, as our works are situated upon the Liverpool and Leeds Canal, and our freehold property contains a bed of Fire Clay nine feet thick. We beg also further to state, either for Body or Glaze, our Pipes will bear comparison with any makers in the trade.

Yours respectfully, O. Brothers & Co.

[Copy.]

Lambeth Pottery, London, July 17, 1856.

Messrs. Brothers & Co., Blackburn.

Gentlemen,—We are informed that you are selling your Pipes in Blackburn subject to 25 per cent. discount.

The usual discount is 10 per cent. Of course, established manufacturers will not submit to be undersold, and the prices will, in consequence, descend to a ruinous figure.

Before giving directions to our Liverpool Works to reduce to any price necessary to secure orders, I shall be glad to know whether you are willling to agree to a uniform discount of 10 per cent., as we have no wish either to reduce or undersell, but we will not lose our customers.

We must beg a line per return of post, and remain,

Yours respectfully,
John Doulton Brothers & Co.

PATENT GAS METER MANUFACTORY,
No. 66, Snow-hill, London.

WILLIAM SMITH, by the improvements he has made in the Wet Meter, and which he has secured by her Majesty's Royal Letters Patent, the accuracy of their registry is rendered certain by the introduction of the adjusting slide and hydraulic, whereby a Perfect Water Level is readily obtained, and the Hydraulic precludes the possibility of abstracting water from the meter by increased pressure or otherwise, thus surmounting the great desideratum of the Wet Meter. In his Patent Equitable Gas Meter neatness and strength are combined, the backs and fronts of the case being stamped by powerful machinery out of thick plate iron (tinned or galvanized); and the internal construction is of the best metal, which will resist the action of any impurity in the gas.

Old Meters may readily have the adjusting slide and hydraulic applied, thereby having accurate measurement assured.

Station Meters, Governors, &c., made on the shortest notice.

By Her Majesty's Royal Letters Patent.

JOSEPH BOULTON,
PATENT DRY GAS-METER MANUFACTURER, and also Maker of his Improved WATER METERS.

No. 28, Bagnigge-wells-road, Clerkenwell, adjoining the Police Office.—Late of No. 1, Coppice-row, LONDON.

Experimental and Station Meters of any size made to order on the shortest notice.—Governors, Pressure Registers, Gas-cooking Stoves, and every description of Gas Apparatus.

MR. WILLIAM RICHARDSON,
CONSULTING ENGINEER,
DUDLEY.

JAMES NEWTON,
FIRE-BRICK AND TILE MERCHANT,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON.

Depôt for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and CLAY, and every Article suitable for

GAS AND WATER WORKS.

WILLIAM RICHARDSON & CO.,
ENGINEERS, IRONFOUNDERS,
AND
CONTRACTORS
for the Erection, Enlargement, and Repair of
GAS & WATER WORKS,
No. 84, CHARLES-STREET, CITY-ROAD,
LONDON.
WORKS:
Tunnel Foundry and Iron Works, DUDLEY.

HARRIS AND PEARSON,
PROPRIETORS OF
BEST CLASS-HOUSE POT AND CRUCIBLE CLAY.
MANUFACTURERS OF
FIRE BRICKS, GAS RETORTS, &C.
Amblecote Fire Clay and Brick Works,
STOURBRIDGE.
Late in the occupation of I. and W. King.
Originally J. Pidcock, Esq.

J. W. & J. CHANDLER,
LATE
BEVERIDGE, HEDLEY, & CHANDLER,
ENGINEERS, MILLWRIGHTS,
IRON AND BRASS FOUNDERS, &c.,
MANUFACTURERS OF ALL DESCRIPTIONS OF GAS AND WATER-WORKS' APPARATUS,
PIPE-TESTING MACHINIST,
NELSON FOUNDRY,
NELSON STREET, MOOR LANE,
PRESTON.

N.B.—A stock of Pipes always on hand, from 1½ inch and upwards.

THROCKLEY CLAY-WORKS,
NEWCASTLE-ON-TYNE.

WILLIAM STEPHENSON and SON
Beg to intimate that they have erected extensive Works for the MANUFACTURE of every description of GAS RETORTS, FIRE-BRICKS, LUMPS, &c.

The Clay having been proved (by analysis and the application of extreme heat) of FIRST-CLASS quality, they can confidently recommend it.

Unexceptional References given, and orders Neatly and Quickly Executed.

London Offices: 76, KING WILLIAM STREET

BRYAN DONKIN and CO.'s improved GAS VALVES have been adopted by numerous Gas Companies in England and abroad, and their advantages and great security fully proved. Very large numbers are in use. Prices from 11s. to 14s. per inch diameter. Bryan Donkin and Co.,
Engineers, Bea Grange-road, Bermondsey.

RETORT AND BOILER SETTING.

FREDERICK SIMMONDS, Sen.,
No. 11, Wellington Street, Old Ford Road, Thirty years RETORT SETTER to some of the leading London and Provincia lGas Companies, to whom he can refer, begs leave to draw attention to his economical mode of Setting Clay or Iron Retorts, &c.

F. S. will engage to provide all materials and labour, or labour only.

WHITWELL PRIMROSE GAS COAL.—These excellent Gas Coals can be shipped either at the South Dock, Sunderland; or Old Harbour, Hartlepool; or Brandling Drops, South Shields; on application to the Whitwell Coal Company, Sunderland.

M. SHEEN, Gas and Railway Lantern Maker, 90½, Holborn Hill, begs to inform Managers of Gas-Works, &c., that she continues to contract and supply Lanterns on reasonable terms, and keep them in repair by the year.

ARTIFICIAL Hydraulic or Portland CEMENT, for Brickwork, Concrete, Plastering, &c., combines the valuable qualities of the natural Cements, with the additional advantage that it greatly excels them in its cementitious properties; that it is not affected by frost, and does not vegetate in damp situations. Account of COMPARATIVE EXPERIMENTS on the strength of this and other Cements (read at the Institute of Civil Engineers) to be obtained from the Makers, John Bazley White and Brothers, Millbank Street, Westminster, who prepare one quality only of Portland Cement.

TO GAS COMPANIES, ENGINEERS, AND MERCHANTS.

EDWIN DIXON,
WROUGHT-IRON TUBE WORKS,
WOLVERHAMPTON,

begs with the utmost confidence to solicit the order of Gas Companies, and persons using or selling Gas Tubes. Having for a long period supplied the largest Gas Companies and Consumers in the United Kingdom and the Continent with unvarying approbation, and almost exclusively the Local Boards of Health under Government Engineers, with Galvanized Iron Tubes and Connections, it has become an inducement to make such facts known.

Large Stock always being on hand, orders of any magnitude, from 10 to 100,000 feet, are executed promptly, and carefully tested by powerful hydraulic pressure before leaving the Works.

Boiler Tubes, Core Bars, Hollow Spindles, and Hydraulic Press Pipes, to resist 5000 lb. to the square inch, made on the shortest notice.

The only Prize Medal of the Great Exhibition, 1851, awarded.

PATENT FIRE-CLAY RETORTS.—O. BROTHERS and COMPANY, Manufacturers of O. Brothers's Patent, beg to state that these Retorts, being made in one entire operation, and in one piece, of any required shape, length, breadth, and height, are not liable to cracks and fissures, of which there is a just and general complaint; and consequently superior to, and cheaper than, any hitherto manufactured.

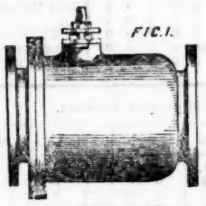
GREAT REDUCTION IN PRICES—20 per cent. cheaper than any other Clay Retorts manufactured.

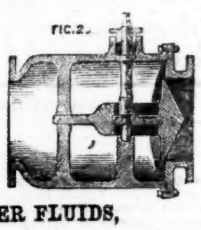
Shape.	Sizes.	Length.	Thickness.	Price at Railway Station, Blackburn.	Price per foot run of any required length, at Blackburn.
		feet.	in.	£ s. d.	s. d.
Dee	12 in. by 12 in.	8	2½	3 0 0	5 0
,,	14 in. by 12 in.	8	2½	3 4 0	5 6
,,	16 in. by 13 in.	8	2½	3 10 0	6 3
,,	18 in. by 14 in.	8	2½	3 16 0	7 0
,,	19 in. by 13 in.	8	2½	3 16 0	7 0
,,	20 in. by 14 in.	9	3½	3 7 6	7 6
,,	24 in. by 15 in.	8	2½	3 12 0	9 0
Round	15 in. by 15 in.	8	2½	2 10 0	6 3
,,	15 in. by 15 in.	10	2½	3 2 6	6 3
,,	18 in. by 18 in.	8	2½	3 0 0	7 6
Oval Retort	18 in. by 12 in.	8	2½	3 0 0	7

All other sizes and shapes in proportion, to order.

References and further particulars may be obtained on application to the Patentee, Gas Works, Blackburn.

WAILES'S PATENT ECCENTRIC VALVE,





FOR GAS, WATER, OR OTHER FLUIDS,

Not to be equalled with regard to Compactness, Simplicity, Non-Liability to Stick, and Economy in Price.

Price, from 9s. to 12s. 6d. per inch diameter.

Further particulars may be had free, on application to WAILES and ROBINSON, Engineers, Founders, &c., 10, Palace Row, New Road, London.

N.B.—Also Manufacturers of the Long and Short Slide and Screw Valves, for Gas and Water. The Long-Slide Valves for Gas kept in stock.

MR. HENRY GORE,
CIVIL AND CONSULTING GAS ENGINEER.
OFFICE,
25, YORK PLACE, LEEDS.

WEST and GREGSON,
GAS-METER MANUFACTURERS, &c.
UNION-STREET, OLDHAM.

Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.

W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

JAMES FEATHERSTONE,
ENGINEER,
Manufacturer of GASHOLDERS, IRON ROOFS, and every description of Gas Apparatus.
ALLIANCE IRON WORKS,
CLAYTON, near MANCHESTER.

JOHN BENT,
MANUFACTURER OF GAS METERS,
283, BELL BAND ROAD,
BIRMINGHAM,
(Established 1830),

Begs respectfully to call the attention of Gas Companies, Engineers, &c., to his WET GAS METER, made upon the most improved principles, the most admirable materials, and warranted to register correctly.

EIGHTON MOOR GAS COALS.—Parties wishing to be supplied with these first-class Gas Coals will please to apply to Mr. MATTHEW NESBIT, EIGHTON MOOR OFFICE, NEWCASTLE-UPON-TYNE. These coals are well known as among the richest in gas, and working the roundest on the River Tyne. They are extensively used by metropolitan gas works.

GEORGE CUTLER,
GASHOLDER MAKER,
No. 8, WENLOCK-ROAD, CITY-ROAD,
LONDON.

Contracts for Tanks, Gasholders, Roofs, Purifiers, and all descriptions of Gas Apparatus executed on the most reasonable terms. Improved Slide Valves, Steam, and Range Boilers, and Smiths' Work, of the best materials and workmanship.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Office in London, Mr. E. M. PERKINS, 78, Lombard Street.

ROBERT MACLAREN,
(Successor to Andrew Liddle and Co.,)
IRONFOUNDER AND GAS ENGINEER.

Manufacturer of Patent Iron Tubing, Block Tin, Lead, and Composition Tubing. Cast-iron Gas and Water Pipes of all sizes, and every description of Gas Apparatus.
GLOBE FOUNDRY, GLASGOW.

H. JONES, Gas Meter Manufacturer, No. 44, OLD-STREET, St. Luke's, London, begs respectfully to call the attention of Gas Companies yto his latest improvements in the WET METER, b means of which water cannot be abstracted, neither can Gas by any possibility pass through the Meter without registering.

JAMES PINCHBECK,
GAS METER MANUFACTURER,
26, CAMDEN-STREET, and 9, PIERREPOINT-ROW,
ISLINGTON, LONDON.

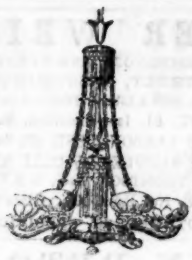
Begs respectfully to announce to Gas Companies and Fitters, that from upwards of 20 years' practical experience, he is enabled to supply a METER combining correctness, durability, and economy.
N.B.—Repairs on the lowest scale.

NOTICE.—Mr. N. DEFRIES, Consulting GAS ENGINEER, begs to inform gas companies and the public, that he is desirous of meeting any gentlemen at his WORKS, NEW ROAD, ST. PANCRAS, where, under his own superindence of the manufacturing department, they will have the fullest opportunity of investigating the many improvements he has recently effected in his ROTARY-VALVE DRY GAS-METER, by which full security will be afforded against leakage and non-registration, even against the searching effects of Cannel Coal Gas. The Rotary-Valve Meter is warranted to register inflexibly correct at a working pressure of half a tenth, and less than a quarter of a foot per hour upon a blue light; and a guarantee will be given to all gas companies to keep it in repair for not less than five years, free of expense. With this meter the gas-supplier may fully depend upon a fair return, and the public upon having a just measurer.

GAS BATHS, GAS COOKING and HEATING STOVES, for all classes. The British Polytechnic Gas-fire, &c. Conservatories and Buildings heated by gas, and perfect ventilation secured.

Any gentleman desirous of consulting Mr. Defries in especial cases, may meet him either at his office, 145, REGENT STREET, or at his residence, 5, FITZROY SQUARE, by giving one day's notice.

Gas-works erected for private houses, where no gas company exists.



F. & C. OSLER,
44, OXFORD-STREET, LONDON;
Manufactory—Broad-street, Birmingham,
MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.
ELEGANT CRYSTAL GLASS CHANDELIERS, FOR GAS

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RUTTER ON GAS LIGHTING.

Hundred and Thirtieth Thousand.
ADVANTAGES
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ITS USES, CONVENIENCES, AND ECONOMY.

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These little books are written in a simple and familiar style; showing the comfort, convenience, safety, and economy of Gas. They are intended for gratuitous distribution by Gas Companies. They have already done good service, and the author is anxious still further to extend their usefulness.

The present high prices of tallow and oil are favourable to a more general adoption of gas in private houses. Let its advantages, as yielding a pure, cheap, and healthful light, be properly explained, and there will be no difficulty in getting over a few old-fashioned prejudices. Those persons who have experienced the benfits of gas-light never go back to candles or lamps.
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(*Successors to the late Samuel Crosley*),
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Beg most respectfully to announce that, in addition to the continued manufacture of GAS METERS, they manufacture Meters for measuring Water, Spirits, &c. (commenced under Patent, in 1849, by the late Mr. William Parkinson).

N.B. These Meters are as simple and durable as the Gas Meter, and as correct as that instrument under the most careful manipulation.

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Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom. Orders promptly executed.

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is the most simple and effective machine of the kind made. It gives no appreciable oscillation or slip; works with extremely little friction; and requires no internal lubrication.

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The first manufacturers of Lapwelded Flues for Locomotive and Marine Boilers.

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Gas Companies, Engineers, Gas Fitters, and the Trade generally, are respectfully informed this Tubing is now manufactured to any size, from ¼ inch bore and upwards, in 100-feet lengths, and perfectly cylindrical, either with or without a spiral wire inside.

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VULCANIZED INDIARUBBER AIR-TIGHT BAGS, made any size, for Gas Mains, with flexible tubes attached, and fitted with stopcocks complete.

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To meet the increasing demand, the Works at Little Harwood have been greatly enlarged; and Gas Engineers who may favour with an Order may rely with confidence on their being promptly supplied with an article not to be surpassed in finish or durability.

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TO GAS COMPANIES, GAS PROPRIETORS, AND GAS ENGINEERS.

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begs to call the attention of the above to his improved METALLIC CASE GAS-METER, an improvement which has met with entire approbation from the various Gas Companies and Engineers to whom he has introduced it, and acknowledged to be the greatest improvement that has been made since the year 1832; at which period a metal was introduced for the construction of the Drum, Syphon, and Float, capable of resisting any impurities arising from either gas or water, which has been found to answer every expectation; as, in repair, Drums of the above date are found in perfect and good condition, when the Outer Case, Valve-box, Inlet-pipe, &c., are quite destroyed and entirely past repair.

J. V. has introduced a coating or lining of the above metal in the Outer Case, Valve-box, Inlet-pipe, &c., thereby rendering the whole as durable as the Drum, as not a particle of tin plate is exposed to the action of either water or gas; and preventing the possibility of gas passing above the water line through the front into the body of the Case to the outlet unregistered, which frequently occurs. When the Meter has been in use for any length of time it is generally found that rust or decay takes place *above* rather than under the water line, which is only discovered when they need repair. Also the Inlet-pipe and Valve-box are generally found quite decayed, which cannot happen in the above improvement.

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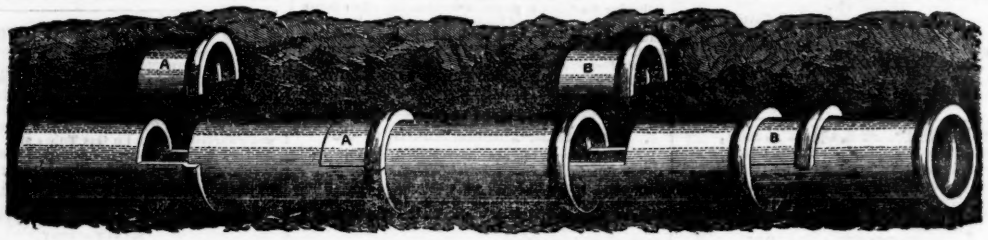

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GAS ENGINEERS AND FOUNDERS,

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Makers of every description of APPARATUS for the MANUFACTURE and DISTRIBUTION of GAS.

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